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WAR MACHINE

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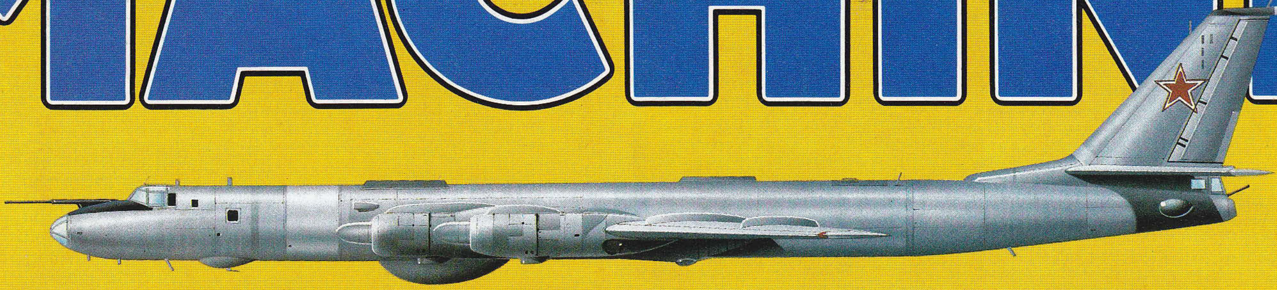

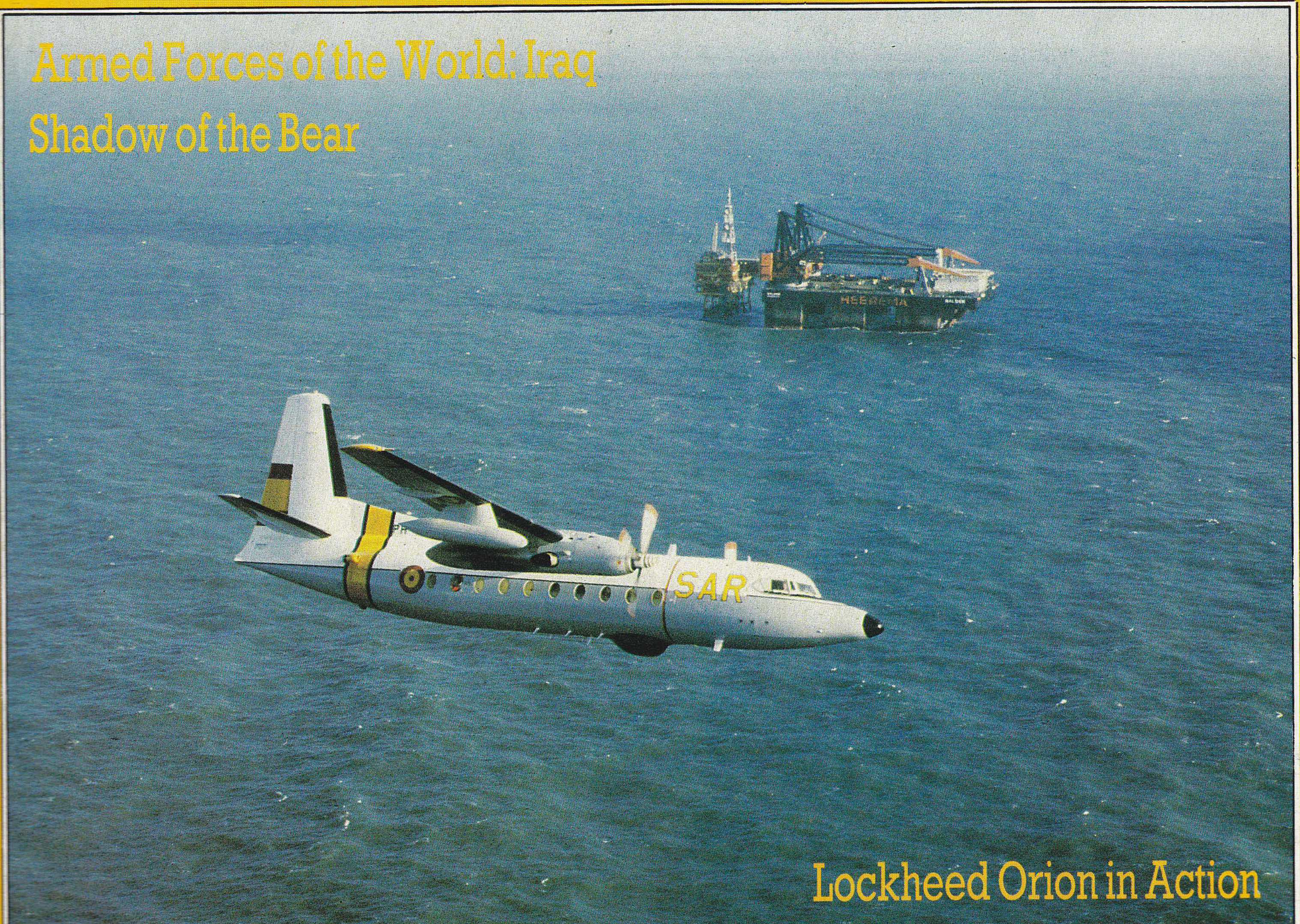

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Shadow of the Bear

Lockheed Orion in Action

Maritime Conversions of Civil Aircraft

A fully illustrated guide to Modern Maritime Aircraft

WAR MACHINE

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Editorial Offices
War Machine
Aerospace Publishing Ltd
179 Dalling Road
London W6 0ES

Managing Editor: Stan Morse
Editorial: Trisha Palmer
Chris Bishop
Chris Chant
Ian Drury

Design: Rod Teasdale
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Artists:
Keith Fretwell
Keith Woodcock

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Subscription Manager: Christine Allen
0488 72666

Consultant Editor: Major General Sir Jeremy Moore KCB OBE MC, Commander of British Land Forces during the Falklands campaign.

Distribution and marketing offices:
Orbis Publishing Ltd
Orbis House
20-22 Bedfordbury
London WC2N 4BT
Telephone: 01-379 6711

Circulation Director: David Breed
Marketing Director: Michael Joyce

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Modern Maritime Aircraft

The most sophisticated modern maritime patrol aircraft are those which have significant ASW capability, such as the Dassault-Breguet Atlantic. The advanced sensors required to track submarines are matched by the range of armaments carried in capacious weapons bays.

From the oilfields of the North Sea to the myriad islands of the Philippines and Indonesia, the maritime boundaries of the modern world are assuming an ever-increasing economic importance. The vast areas involved must be guarded, and by far the most effective and far-reaching method is from the air.

One of the most often repeated statistics concerning the Earth is that two-thirds of its surface is covered with water. A further fact worthy of mention is that many who live on the land have a keen interest in what happens on and under the water. Other countries' warships, illegal fishermen, smugglers and several sources of pollution are to be found on the high seas, and it is an unwise government that takes an interest only when such problems come within sight of the coast.

Aircraft represent a highly effective method of locating these potential problems in the oceans' vastness, most (but not all) such aircraft being land-based types. The larger amongst these, possessing considerable range, are designated maritime patrol or maritime reconnaissance aircraft, and are exemplified by the US Navy's Lockheed P-3 Orion patroller and the RAF's BAe Nimrod MR.Mk 2 reconnaissance platform. Such aircraft are extensively equipped with complex avionics for the difficult task of locating submarines, and their armament includes depth charges and torpedoes. They may also carry medium-range missiles to provide an anti-surface vessel (ASV) capability.

Of lesser sophistication are the maritime surveillance aircraft, usually equipped with radar, but lacking anti-submarine warfare (ASW) equipment except of the simplest kind. It is these which are most often adaptations of transport aircraft or business jets for protection of economic zones, and in several cases they carry little or no weaponry. However, recent models of the Fokker F.27 Maritime, with their missile armament, have clearly moved into a higher bracket and are to be regarded as front-line equipment.

An almost universal aspect of maritime aircraft is that they are equipped for search-and-rescue (SAR) missions, the usual requirements being carried including emergency kits (containing an inflatable boat, food, etc.) and the appropriate radios for direct contact with other emergency services. It is in this role that MR aircraft often make the news, but to seagoing nations their principal role is as the fast, long-range 'eyes and ears' of the navy.

Operating above two 'Oberon' class submarines of the Royal Navy, the British Aerospace Nimrod has for more than a decade been one of the most advanced maritime reconnaissance aircraft in the world. In addition to its reconnaissance function, the Nimrod also has the comprehensive electronic and weapon fit necessary to hunt submarines.

BRAZIL

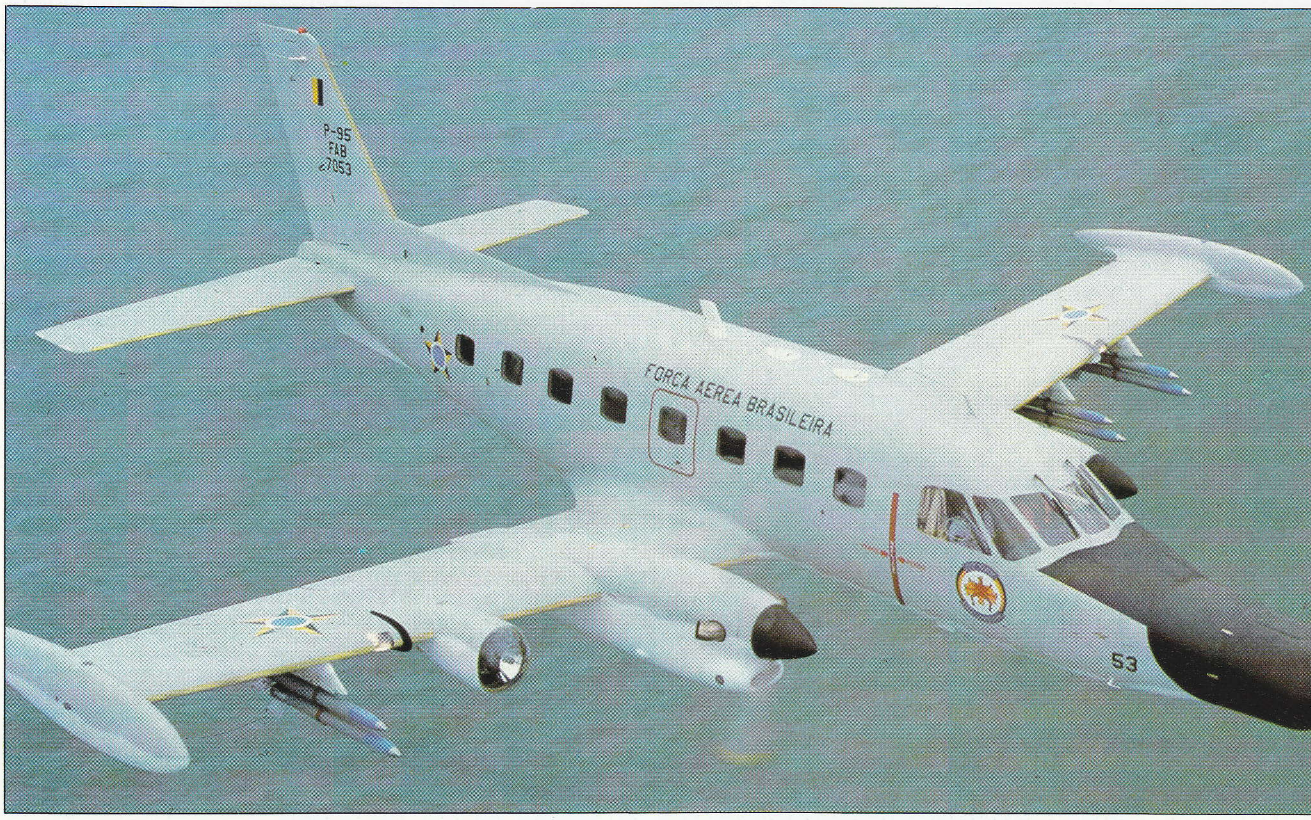
EMBRAER EMB-110 and EMB-111

EMBRAER of Sao José dos Campos, Brazil, came into operation only in 1970 but has already built more than 3,000 aircraft and has made Brazil a leading aircraft producer. Its wide range includes the best-selling **EMBRAER EMB-110 Bandeirante** (pioneer), sold in numbers as a light twin-turboprop airliner even to the UK, the USA and France. The **EMB-110S1** is a remote-sensor geophysical model with MAD tailboom, the **EMB-110P1K** is a mass-produced military transport (called **C-95A** by the Brazilian air force) and among many other offshoots is the short-body pressurized **EMB-121 Xingu** family called **VU-9** by the Brazilian air force and bought as the standard aircrew trainer and liaison transport for the French Armée de l'Air (25) and Aéronavale (16). The **EMB-111** is a comprehensively equipped maritime surveillance aircraft, with a mainly Collins avionics fit but including AIL nose radar, Bendix autopilot, Thomson-CSF passive ECM and optional Omega receiver. The normal crew numbers 3-7 and the interior is equipped not only with displays and observation stations but also for cargo and paratrooping or equipment dropping. The **EMB-111** first flew on 15 August 1977, and 12 were sold to the Brazilian air force coastal command with designation **P-95**. The first of a growing list of export customers was Chile, whose aircraft have full de-icing and passive ECM under the nose.

Specification
EMB-111

Type: maritime surveillance aircraft
Powerplant: two 559.3-kW (750-shp) Pratt & Whitney of Canada PT6A-34 turboprops
Performance: (at maximum weight, ISA+15°C, a severe criterion) maximum cruising speed 385 km/h (239 mph); range at 3048 m (10,000 ft) with 45-minute reserves 2945 km (1,830 miles)
Weights: empty 3760 kg (8,289 lb); maximum take-off 7000 kg (15,432 lb)
Dimensions: span 15.95 m (52 ft 4 in); length 14.91 m (48 ft 11 in); height 4.91 m (16 ft 1.3 m); wing area 29.1 m² (313.24 sq ft)
Armament: four wing pylons for four pairs of 12.7-cm (5-in) HVAR rockets or launchers each with seven 69.9-mm (2.75-in) FFAR rockets, or three stores pylons plus 50 million candlepower searchlight; other gear includes smoke bombs, markers, flares, chaff dispenser and loud hailer

Entering service with the Forca Aérea Brasileira in April 1978, the EMB-111 carries pairs of 12.7-cm (5-in) HVAR rockets together with a searchlight of 50 million candlepower on the starboard wing.



USA

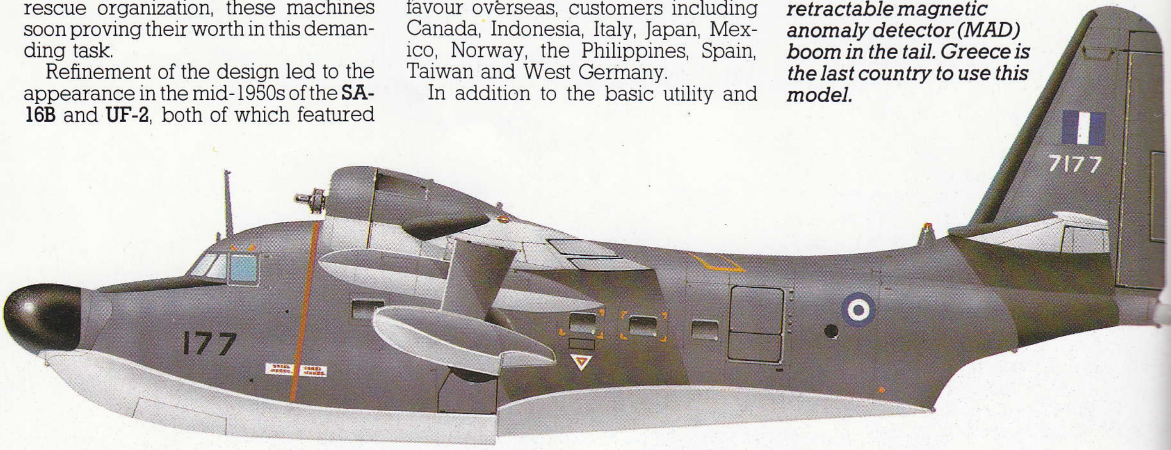
Grumman HU-16 Albatross

Although no longer operational with any element of the US armed forces, the distinctive **Grumman Albatross** amphibian still serves with a number of other air arms in a variety of roles ranging from air-sea rescue through liaison and communications to anti-submarine warfare. It also holds the distinction of being the last amphibian to see service with the US armed forces and in its heyday established a number of world records for aircraft in its class.

A logical outgrowth of earlier Grumman amphibians such as the Goose and Widgeon, the Albatross began development in the closing stages of World War II, the aircraft which eventually emerged being significantly larger than its predecessors although it bore a strong family resemblance. Initially ordered by the US Navy, the prototype **XRJ2F-1** made its maiden flight on 24 October 1947, subsequently entering service as the **UF-1** in July 1949. Originally intended to fulfil mainly utility functions, the Albatross soon proved to be a most versatile machine, and another notable early customer was the US Air Force which acquired a large number of **SA-16A** aircraft for the Military Air Transport Service's air rescue organization, these machines soon proving their worth in this demanding task.

Refinement of the design led to the appearance in the mid-1950s of the **SA-16B** and **UF-2**, both of which featured increased wing span and larger tail surfaces as well as more effective de-icing equipment. Many earlier aircraft were eventually brought to this later standard and the type also found favour overseas, customers including Canada, Indonesia, Italy, Japan, Mexico, Norway, the Philippines, Spain, Taiwan and West Germany.

In addition to the basic utility and



The ASW version of the Grumman HU-16 is distinguishable by the larger search radar in the nose together with a retractable magnetic anomaly detector (MAD) boom in the tail. Greece is the last country to use this model.

rescue versions, an ASW-capable Albatross was also conceived by Grumman, this featuring such familiar items as nose-mounted radar, a searchlight, a MAD (Magnetic Anomaly Detector) boom and specialized ordnance including torpedoes and depth charges. Most, if not all, ASW-configured aircraft were simply conversions of HU-16Bs, and they retained the same designation following conversion, examples of the type being known to have served with the air arms of Greece, Spain and Turkey, although only the first is believed still to use the Albatross for ASW duties.

Specification

HU-16B Albatross

Type: anti-submarine warfare, utility and rescue amphibian

Powerplant: two 1062.6-kW (1,425-hp) Wright R-1820-76A/76B Cyclone radial piston engines

Performance: maximum speed 380 km/h (236 mph) at sea level; cruising speed 241 km/h (150 mph); range with 4826 litres (1,275 US gal) of fuel 4345 km (2,700 miles); maximum endurance 22 hours 54 minutes

Dimensions: span 29.46 m (96 ft 8 in); length 18.67 m (61 ft 3 in); height 7.87 m (25 ft 10 in); wing area 96.15 m^2 (1,035 sq ft)

Armament: four underwing hardpoints capable of carrying depth bombs, mines, unguided air-to-surface rockets and torpedoes; in addition, depth charges and sonobuoys are carried internally

NETHERLANDS

Fokker F.27 Maritime

The three Spanish F.27 Maritimes operate out of the Canaries on general unarmed patrol and SAR missions. An armed, ASW-dedicated version is available, the Maritime Enforcer.

The **Fokker F.27 Maritime** is an adaptation of the Friendship turboprop transport, which first flew in 1955 and remains in production to this day. Foreseeing a market for a medium-range maritime patrol aircraft to replace such stalwarts as the Lockheed Neptune and the Grumman Tracker and Albatross, Fokker began conversion of a prototype **F.27MPA** (Maritime Patrol Aircraft) in 1975, this making its initial flight during February 1976. Unarmed in its initial form, the aircraft is suitable for sealane and fishery patrol, offshore oilfield policing, SAR and pollution control, its prime sensor being a Litton AN/APS-504(V)2 360° radar scanner mounted in a ventral radome. Up to six crew members are carried. Peru's navy received the first two F.27 Maritimes in September 1977 and February 1978, whilst other customers have comprised the Spanish air force, with three supplied in 1979 for patrol and SAR missions from the Canary Islands (Spanish military designation **D.2**); the Philippine navy which received three in 1981-2; the Angolan air force with one; the Dutch air force (mixed air force and navy crews) with two delivered in 1981-2 for missions in the Antilles; and the Nigerian air force with two supplied in 1984.

A major upgrading of the design came in 1984 when the **Maritime Enforcer** was revealed, three examples for Thailand's navy being the first order. The Enforcer is an ASW aircraft equipped with Marconi central tactical and sonobuoy processing systems, plus an Alkan stores-management system. It can locate submarines and all classes of surface vessels using not only search radar, but also passive and active acoustic equipment (via sonobuoys launched from bays in the rear fuselage) and an electronic surveillance and monitoring system. Inputs from these sensors, together with visual observations, are fed into a central display controlled by the tactical coordinator. Most importantly, however, the Maritime Enforcer has provision for armament; up to six torpedoes, or depth charges for ASW, or up to four anti-ship missiles on a new stores position at the lower sides of the centre fuselage.

Specification

F.27 Maritime Enforcer

Type: maritime patrol aircraft

Powerplant: two 1,730-kW (2,320-shp) Rolls-Royce Dart Mk 536-7R turboprops

Performance: cruising speed 463 km/h (288 mph); patrol speed 277-333 km/h (172-207 mph) at 457 m (1,500 ft); initial climb rate 442 m (1,450 ft) per minute; service ceiling 8990 m (29,495 ft); range 5000 km (3,107 miles) with wing pylon tanks

Weights: empty 12519 kg (27,600 lb); maximum take-off 20412 kg (45,000 lb)

Dimensions: span 29.00 m (95 ft 1.7 in); length 23.56 m (77 ft 3.6 in); height 8.50 m (27 ft 10.6 in); wing area 70.00 m^2 (753.5 sq ft)

Armament: up to four Aérospatiale AM.39 Excocet or McDonnell Douglas AGM-84A Harpoon ASMs, or six bombs/depth charges/torpedoes

USA

Grumman S-2 Tracker

Still in widespread service over 30 years after first flight (on 4 December 1952), the **Grumman G-89 Tracker** was the first successful carrier-based ASW aircraft, containing the search and attack capability in one aircraft. Piston engines were chosen for sea-level endurance of 9 hours, and the crew of four were seated in a single nose compartment. Weapons were housed internally and under the high-mounted folding wing, and after entering US Navy service in 1954 with the basic designation **S-2** production reached a total of 1,181 in five major versions, not including the **C-1 Trader** COD (Carrier On-board Delivery) transport and **E-1 Tracer** surveillance versions. DH Canada built 100 in two versions, and though many **S-2A** aircraft and other variants were progressively updated, the chief type today is the **S-2E** (245 built) with the longer span, bigger cockpit and bigger tail of the **S-2D** plus a range of improved sensors. The last recipient was the Royal Australian Navy, which lost all but three of its S-2Es in a hangar fire in December 1976; the USN quickly provided 16 replacement aircraft. Several countries use the **TS-2** (usually **TS-2A** conversion) as a trainer; others use **US-2** utility and **RS-2** photographic aircraft.

Specfication

S-2E Tracker

Type: ASW aircraft

Powerplant: two 1137.2-kW (1,525-hp) Wright R-1820-82WA Cyclone piston engines

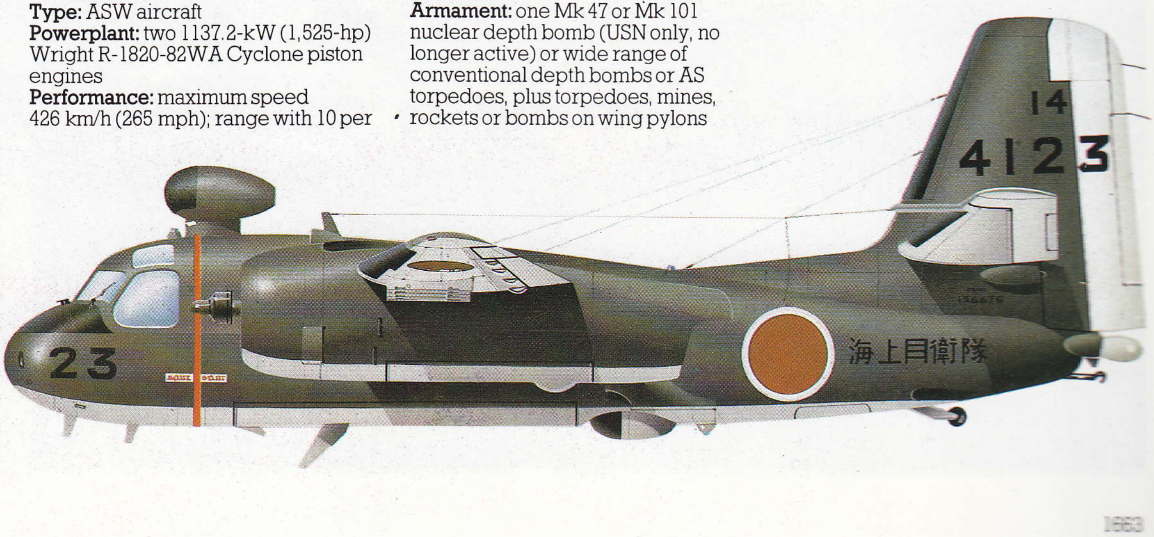
Performance: maximum speed 426 km/h (265 mph); range with 10 per cent reserve 2092 km (1,300 miles)

Weights: empty 8505 kg (18,750 lb); maximum take-off 13222 kg (29,150 lb)

Dimensions: span 22.12 m (72 ft 7 in); length 13.26 m (43 ft 6 in); height 5.05 m (16 ft 7 in); wing area 46.08 m^2 (496 sq ft)

Armament: one Mk 47 or Mk 101 nuclear depth bomb (USN only, no longer active) or wide range of conventional depth bombs or AS torpedoes, plus torpedoes, mines, rockets or bombs on wing pylons

Primarily a carrierbased ASW aircraft, the Grumman S-2 Tracker no longer serves aboard the carriers of the US Navy, but is still in widespread use worldwide. Japan used the aircraft for many years.



Maritime Conversions of Civil Aircraft

Maritime aircraft are used for a wide variety of purposes, not all of which require the high technology avionics, detection gear and weaponry appropriate to hunting nuclear submarines. For many nations, the maritime role consists of such jobs as fishery protection, prevention of smuggling or search and rescue. Obviously, an advanced ASW-dedicated aircraft is not what is required.

Despite the complex and expensive detection equipment fitted to the major types of maritime patrol aircraft, it may be argued that any aeroplane from which it is possible to see the Earth's surface while in flight can be used for over-water surveillance. Indeed, landlocked Paraguay employs a handful of single-engine Cessnas for river patrol, and the RAF's BAe (English Electric/BAC) Canberras are assigned to visual maritime reconnaissance in an emergency, but these can hardly be described as dedicated MR aircraft. However, to meet the requirements of those countries for which a Lockheed Orion or even a Fokker F.27MP would be inappropriate or too costly, the world's aircraft manufacturers offer a range of adaptations of existing models.

Almost all are twin-engine transports or executive aircraft which are required to patrol only as far as the edge of a country's 322-km (200-mile) exclusive economic zone (EEZ). The minimum standard of modification may be taken as addition of surveillance radar, so that vessels may be sought out rather than happened upon. Invariably there are other low-cost changes such as bulged windows for direct downward view by lookouts, and perhaps a more comprehensive navigation fit. The latter is important if the aircraft's duties are to include identification of vessels fishing illegally on the borders of the EEZ. There may also be a requirement for search-and-rescue operations, for which additional radio equipment is demanded, and the ability to drop liferafts and survival kits is a useful asset.

Such features, plus optional FLIR (Forward-Looking Infra-Red) and LLLTV (Low-Light-Level TV), are offered by Beech in its Maritime Patrol 200T version of the popular Super King Air turboprop twin. Announced in 1977, this has provision for removable wingtip tanks to give a maximum on-station time of nine hours, and customers include the Uruguayan navy, which received one such aircraft in January 1981. A further 15 civilian models have been delivered to the Japanese Coast Guard (known as the Maritime Safety Agency) and two more to Algeria.

Also from the USA is a rather unlikely medium-sized pure jet patroller in the form of the Boeing 737 Surveiller. While retaining the ability to carry 102 passengers, the three Model 737-200s delivered to the Indonesian air force in 1983 have a maritime radar reconnaissance capability provided by a Motorola SLAMMR (Side-Looking Airborne Multi-Mission Radar) whose two 4.9-m (16-ft) blade aerials are mounted on the sides of the upper rear fuselage. Flying at 9145 m (30,000 ft), the aircraft can locate a small ship in heavy seas at a distance of 161 km (100 miles), so that it is able to cover an entire EEZ with a single pass 161 km (100 miles) from the coastline.

Spain's CASA has had some success with its C-212 Aviocar in ASW and patrol/SAR versions, each fitted with a prominent nose radome and (for ASW) such extras as a sonobuoy processing system and electronic support measures (ESM). The home air force has received seven SAR examples, plus two conversions of earlier C-212s, and the ministry of finance has bought another three. Exports have involved a patrol model to Uruguay's air force, fitted with an AN/APS-128 270° search radar, and three similar aircraft to the Venezuelan navy in 1982.

Canadian aircraft

Canada has a very extensive coastline, and relies on Orions and Trackers to meet military MR requirements, but de Havilland Canada has two versions of its well-known STOL family on the international market. The Twin Otter in its DHC-6-300M military guise has a maritime reconnaissance variant with a distinctive chin radome for a Litton AN/APS-504(V)2 radar. Also able to carry light armament on wing pylons, one of this type has been delivered to the Senegalese air force. The Canadian Environment Ministry has acquired a single extended-range DHC-7R Ranger equipped with SLAR and a laser profilometer to provide an image of its targets, though these are no more warlike than icebergs which may threaten shipping lanes and offshore oilfields. In passing, it may be mentioned that coastal patrol and SAR are included in the tasks of the 14 remaining (from 19 delivered) Canadair CL-215 'water-bombers' supplied to Spain's air force.

One of the more successful adaptations for MR comes from France in the form of the Dassault-Breguet Guardian/Gardien versions of the best-selling Falcon 20/200 executive twin-jet. No less than 41 were ordered in 1977 when the US Coast Guard selected the maritime Falcon 20G to meet its medium-range surveillance requirement. Designated HU-25A Guardians, these were delivered from 1982 onwards, fitted with a comprehensive sensor suite including SLAR, FLIR, infra-red and ultra-violet scanners and laser-illuminated TV camera for all-weather detection. Similar, but with less equipment, are the five Gardiens delivered to the French navy for surveillance tasks in the Pacific territories and declared operational in August 1984.

Above: The Australian Government Aircraft Factory Nomad is typical of the many basic aircraft adapted to the maritime function. The Searchmaster B of the Indonesian Naval Air Arm provides a basic MR capability, with a Bendix RDR 1400 forward-looking surface search radar in the extended nose.

COAST GUARD

Left: Dassault-Breguet achieved a real coup with their sale of the surveillance version of the Falcon 20 executive jet to the US Coast Guard. Known as the HU-25A in US service, the Guardian, as it is called, is not armed, but has a state-of-the-art sensor fit, including radar, ultra-violet and infra-red detectors.

Remaining with European manufacturers, the Dornier range of twin turboprop transports has its MR derivatives fitted with MEL Marec radar in the chin position, including two Do 128-2s with the Moroccan air force and three Do 128-2s operated by the Cameroun air force. Two models of the Do 228 Maritime Patrol are being offered: Version 'A' with Marec II for fishery protection and anti-smuggling; and Version 'B' carrying SLAR as a pollution control aircraft with additional surveillance and fishery roles. Indian production of the Do 228 will include 36 of the 'A' model for its coast guard.

When Denmark chose a surveillance aircraft to protect its interests in the cold waters around Greenland and the Faroes it looked to the United States. From January 1982 onwards three Gulfstream Aerospace Gulfstream IIIs were supplied, their equipment including an AN/APS-127 search radar in place of the normal nose-mounted weather radar and provision for firing of flares and dropping SAR equipment. They have masses of special electronics.

Australia's contribution to the field, the GAF Nomad, is available in Searchmaster B form with Bendix RDR 1400 radar or as the more extensively-equipped Searchmaster L mounting a Litton APS-504(V)2 radar in the chin position. Indonesia's navy has 12 Searchmaster Bs and six Searchmaster Ls; Papua New Guinea operates three Searchmaster Bs; and the Thai navy took delivery of four Searchmaster Ls (equipped with SSQ-801 Barra sonobuoys) in 1984, plus a fifth funded by the United Nations for anti-pirate patrols.

The same APS-504(V)2 radar is fitted beneath the Israel Aircraft Industries 1124N Sea Scan version of the Westwind business twinjet. Three are used by the local air arm for coast patrol (with particular attention paid to possible terrorist infiltration) and a more elaborate ASW version is in prospect. Israeli knowhow is also believed to be employed in the four Lockheed Electra ex-airliners bought for conversion to MR and electronic intelligence (Elint) models by the Argentine navy following the Falklands war.

Facing an embargo on military equipment, South Africa is having difficulty in finding a substitute for its Avro Shackletons (withdrawn in 1984), but short-range patrol work is undertaken by 19 radar-equipped Piaggio P.166S Albatross twins. A maritime version of the current model, designated P.166-DL3-MAR and fitted with four underwing pylons, is on the market, and six are expected to be delivered to Italy's Servizio Nazionale della Protezione Civile for pollution patrols and similar work.

Limited success has been obtained by Piper with its quick-change Maritime Surveillance Cheyenne II, two of which were delivered to the Mauritanian air force in 1981, each complete with a pair of 70-mm reconnaissance cameras, plus a search radar in a pod beneath the port wing. In contrast, however, customers are still awaited for the Transall C.160S (Thomson-CSF VARAN radar) and BAe's Jetstream 31EZ, which will have a belly-mounted radar and be similar in appearance to the four Jetstream T.Mk 3 trainers (Racal ASR 360 radar) ordered by the Royal Navy in 1984.

Above: The Boeing 737-200 Surveillers delivered to the Indonesian air force have a dual purpose; while retaining seating for 14 first-class and 88 other passengers, they are also fitted with high resolution Side-Looking Airborne Multi-Mission Radar, capable of scanning 160 km (100 miles) each side.

Below: Designed as a water bomber to fight forest fires, the Canadair CL-215 is also used for search and rescue, utility transport and coastal patrol. The two aircraft operated by the Royal Thai navy are equipped for coastal patrol, and are fitted with a search radar.

ROYAL THAI NAVY

USA

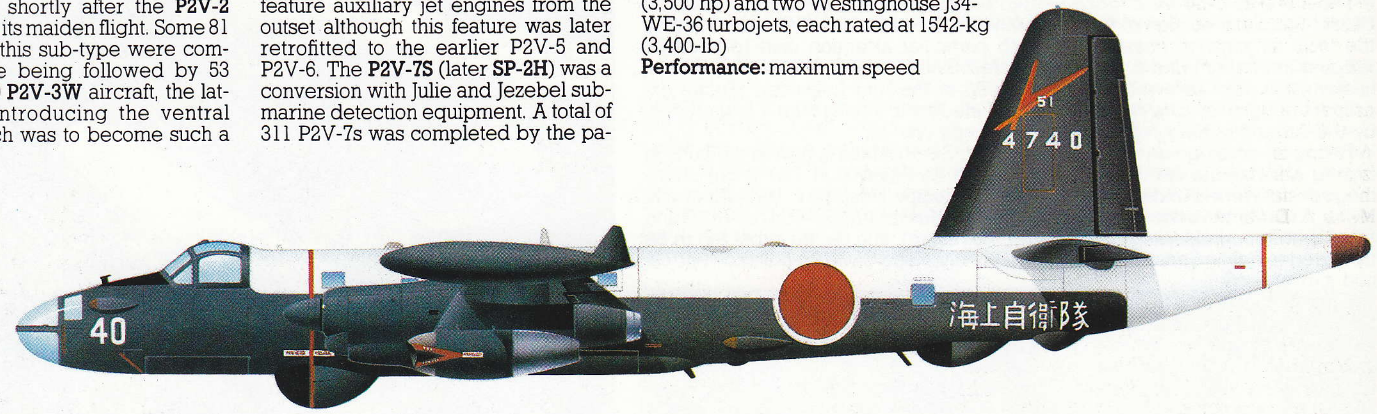
Lockheed P-2 Neptune

In terms of numbers built arguably the most successful post-war maritime aircraft, the **Lockheed Neptune** can in fact be traced as a development back to September 1941, when work began on the company's **Model 26**. However, the more urgent considerations of World War II dictated a very leisurely rate of progress, and it was not until April 1944 that Lockheed received a contract covering the construction of a pair of **XP2V-1** prototypes and an initial production batch of just 15 **P2V-1** aircraft. Subsequent developments of the Neptune enabled the type to remain in continuous production for close to 35 years, thus establishing an exceptional longevity record.

Flown for the first time in prototype form on 17 May 1945, the Neptune duly entered service with the US Navy in March 1947, shortly after the **P2V-2** variant made its maiden flight. Some 81 examples of this sub-type were completed, these being followed by 53 **P2V-3** and 30 **P2V-3W** aircraft, the latter model introducing the ventral radome which was to become such a characteristic feature of the Neptune. Production then switched to the **P2V-4** (later designated **P-2D**), but only 52 were completed before the **P2V-5** (later **P-2E**) made its debut, this eventually becoming the most numerous version, some 424 being produced for service with the US Navy and a number of other countries including Argentina, Australia, Brazil, the Netherlands, Portugal and the UK.

Further refinements to the basic design led to the appearance of the **P2V-6** (later **P-2F**) in late 1952, 67 standard aircraft being followed by 16 specially-configured **P2V-6M** aircraft which were compatible with the Fairchild AUM-N-2 Petrel air-to-surface missile. Lockheed production of the Neptune terminated with the **P2V-7** (later **P-2H**) version, which was the only model to feature auxiliary jet engines from the outset although this feature was later retrofitted to the earlier P2V-5 and P2V-6. The **P2V-7S** (later **SP-2H**) was a conversion with Julie and Jezebel submarine detection equipment. A total of 311 P2V-7s was completed by the parent company, these being supplemented by 48 Japanese-built examples, and it was Japan which was the source of the final production version, namely the **P2V-7KAI** which benefitted from the adoption of turboprop engines, a pair of General Electric-IHI T64s replacing the Wright R-3350 radial engines of earlier Neptunes. Production of the P2V-7KAI (later **P-2J**) eventually ceased with the completion of the 82nd example, this bringing the total number of Neptunes built to 1,133.

Specification
SP-2H Neptune
Type: maritime patrol and anti-submarine warfare aircraft
Powerplant: two Wright R-3350-32W Turbo-Compound 18-cylinder radial piston engines, each rated at 2610 kW (3,500 hp) and two Westinghouse J34-WE-36 turbojets, each rated at 1542-kg (3,400-lb)
Performance: maximum speed 649 km/h (403 mph) at 3048 m (10,000 ft); patrol cruising speed 333 km/h (207 mph) at 2591 m (8,500 ft); ferry range 5930 km (3,685 miles)
Weights: empty 22650 kg (49,935 lb); maximum take-off 36240 kg (79,895 lb)
Dimensions: span 31.65 m (103 ft 10 in); length 27.84 m (91 ft 4 in); height 8.94 m (29 ft 4 in); wing area 92.90 m^2 (1,000 sq ft)
Armament: assortment of mines, depth charges, bombs and torpedoes can be housed in an internal weapons bay; underwing stores stations can accommodate additional ordnance including bombs and high-velocity aerial rockets



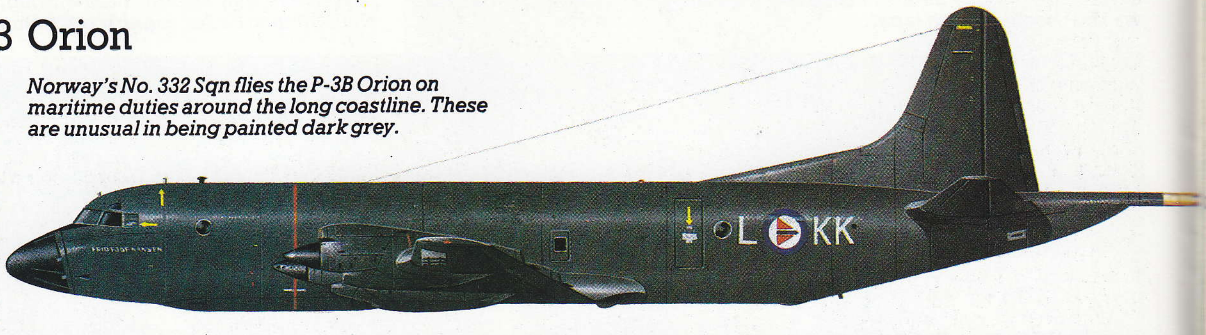
Still in service in large numbers with the air arm of the Japanese Maritime Self-Defence Force, the Lockheed P-2 has now been in service for almost four decades.

USA

Lockheed P-3 Orion

By August 1957 it appeared the Lockheed P-2 Neptune was coming to the end of its development, and the US Navy invited submissions for a replacement. Lockheed won with a patrol/ASW derivative of its **L-188 Electra** civil transport, the **Lockheed P-3 Orion** with airframe almost unchanged except for the addition of an unpressurized weapon bay ahead of the wing in a shortened fuselage, pylons for external stores and a MAD boom behind the tail. An aerodynamic prototype with these changes flew on 19 August 1958. The first production **P-3A** flew on 15 April 1961 and by 1983 Lockheed-California had delivered almost 600 P-3s of successively improved models. Most are regular maritime patrol aircraft but the US Navy uses **EP-3B** and **EP-3E** electronic-warfare platforms with giant canoe radars, **RP-3A** machines are special reconnaissance aircraft and four **WP-3A** aircraft fly weather missions. The standard 1985 model is the **P-3C Update III**, the various Update programmes having contributed improved sensors, data-processing, nav/com and other avionic systems. The Canadian Armed Forces bought 18 **CP-140 Aurora** aircraft which packaged the Lockheed S-3A sensors, avionics and data-processing systems into the P-3 airframe. Japan's 45 **P-3C Update II** aircraft comprise three flown from Lockheed, and four assembled and 38 licence-built by Kawasaki.

Norway's No. 332 Sqn flies the P-3B Orion on maritime duties around the long coastline. These are unusual in being painted dark grey.



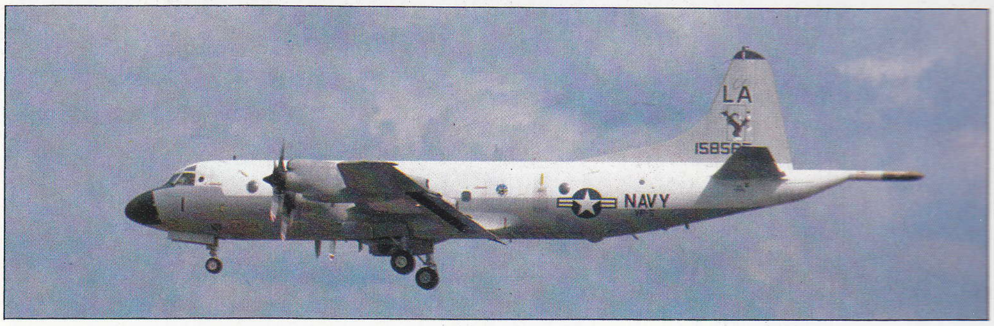
Specification
P-3C Orion
Type: maritime patrol and ASW aircraft
Powerplant: four 3661.4-ekW (4,910-ehp) Allison T56-14 turboprops
Performance: maximum speed at a weight of 47628 kg (105,000 lb) 761 km/h (473 mph); maximum radius with no time on station 3835 km (2,383 miles)
Weights: empty 27891 kg (61,491 lb); maximum take-off 64410 kg (142,000 lb)
Dimensions: span 30.38 m (99 ft 8 in); length 35.61 m (116 ft 10 in); height 10.27 m (33 ft 8.5 in); wing area 120.77 m^2 (1,300 sq ft)
Armament: total expendable load 9072 kg (20,000 lb) comprising up to 3289 kg (7,252 lb) in internal bay (made up typically of two Mk 101 depth bombs, four Mk 44 torpedoes and numerous sensors/signals) plus underwing load on 10 pylons (maximum six 907-kg/2,000-lb mines)

CANADA
N64996

The Canadian Armed Forces have bought 18 Lockheed CP-140 Auroras, these being standard P-3 airframes but with the electronic and sensor package found in the same company's S-3 Viking.

Lockheed Orion in Action

Developed from the Lockheed Electra airliner, the P-3 Orion has become the West's primary long-range ASW and maritime patrol aircraft. More than 550 Orions have flown since the late 1950s.


The P-3C variant of the Orion forms the backbone of the US Navy's shore-based ASW patrol force. This aircraft is from VP-5 (Patrol Squadron 5), usually based at Jacksonville, Florida.

The backbone of the US Navy's shore-based anti-submarine warfare and long-range patrol forces for more than 15 years, the Lockheed P-3 Orion has proved to be a most worthy successor to the same company's Neptune, and with production continuing at a modest rate for this service and for a number of overseas customers, the Orion looks like being around for a good many more years yet.

Based on the fairly successful Electra airliner, the Orion began development in earnest way back in August 1957 with the issue of Type Specification No. 146 by the Chief of Naval Operations, the Lockheed proposal being one of several submissions for this potentially lucrative project. Close study of these soon revealed that the P3V-1, as it was originally known, was by far the most suitable candidate, and Lockheed's initiative was rewarded in October 1958 by a contract covering procurement of long-lead-time items, this being rapidly followed by another for development of the sophisticated sensors and systems earmarked for installation in the new patrol aircraft.

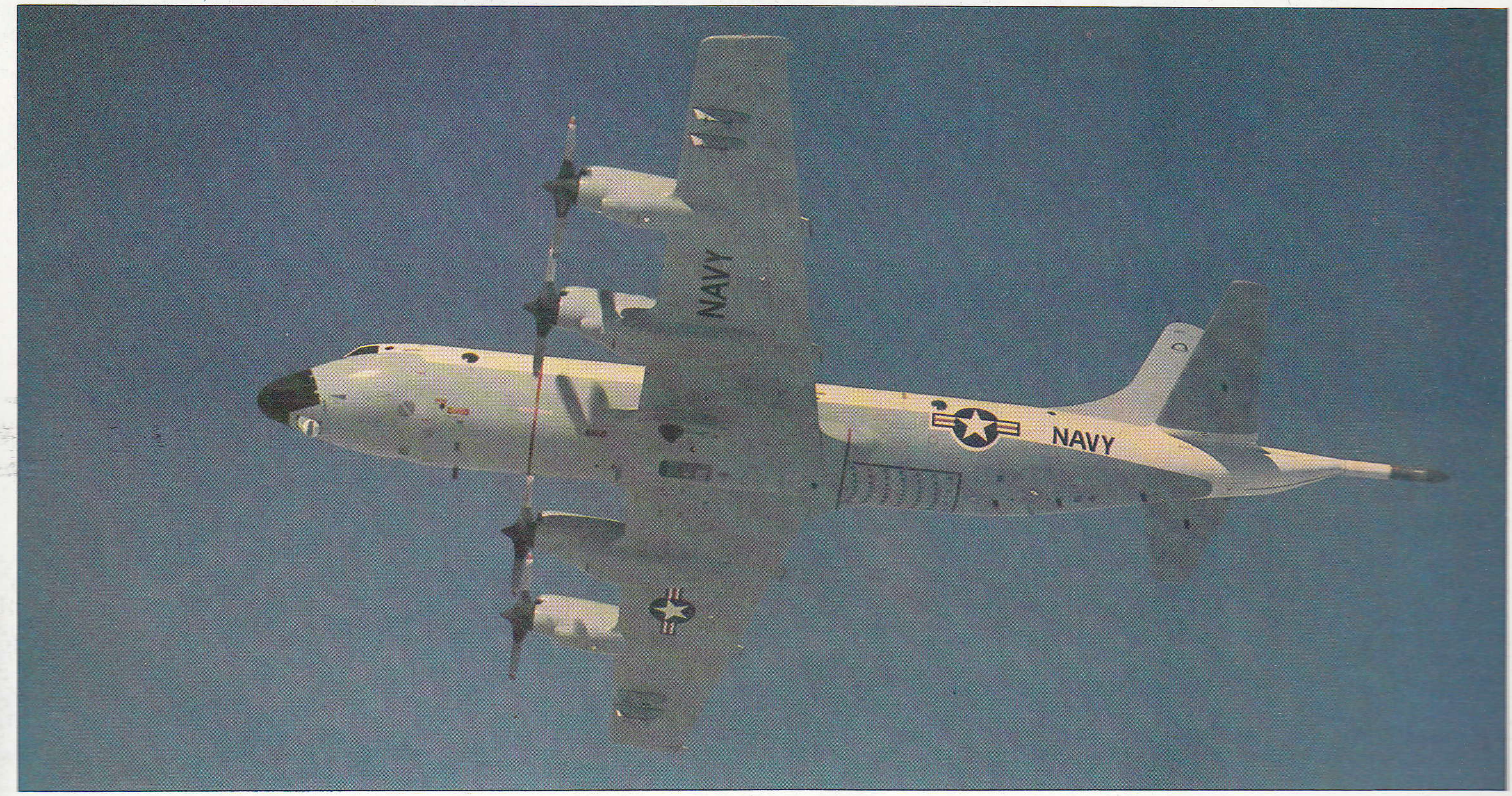
Representing a quantum leap in the anti-submarine warfare state of the art, the Orion was of necessity developed over a fairly protracted period, and it was not until August 1962 that the type entered service, the initial P-3A production model joining Patrol Squadron VP-8 at Patuxent River, Maryland. Subsequently, this and more capable later variants progressively replaced the P-2 Neptune and Martin P-5 Marlin that were rapidly becoming obsolescent. Today, all 24 operational US Navy patrol squadrons are equipped with either the P-3B or P-3C versions of the Orion, while a further 13 Reserve Force squadrons operate examples of the P-3A and P-3B. Other nations operating variants of the P-3 comprise Spain (P-3A), Japan (P-3C), the Netherlands (P-3C), Norway (P-3B), Iran (P-3F), Australia (P-3C), New Zealand (P-3B) and Canada (CP-140 Aurora). In the meantime, continuing development of the basic design has mainly centred around enhancing detection and data-processing capability, and the Orion of today is thus a very different beast from that which entered service more than 20 years ago.

Loitering capability

Possessing a maximum mission endurance in the order of 17 hours, the Orion is in many ways ideally suited to the special demands of ASW/patrol duties, enjoying reasonably fast en-route cruise speeds while also being able to loiter in the vicinity of a target or suspected target for as much as seven hours at distances of up to 1850 km (1,150 miles) from base. As far as offensive capability is concerned, the Orion has a capacious bomb bay which houses a variety of weapons such as mines, depth charges and torpedoes, further ordnance such as the AGM-84 Harpoon air-to-surface anti-shipping missile being carried under the wing on the latest production models. Since much of the Orion's mission is concerned with detection and surveillance of Soviet submarines, it follows that a large number of sonobuoys are also carried, these still being one of the prime sensor types employed in the three-dimensional game of 'hide-and-seek' to which ASW has been likened. On the P-3C some 48 size 'A' sonobuoys are carried in a bank of launch tubes situated beneath the fuselage just aft of the wing, these being loaded and unloaded from outside whilst the aircraft is on the ground, but there are also four launching tubes in the cabin for size 'A' and 'B' stores, adjacent racking permitting extra sonobuoys to be carried internally.

In the course of a typical mission, a single Orion can cover a vast expanse of water, and although the P-3 is most commonly associated with anti-submarine warfare, it should not be forgotten that much of the type's work is of a

On the bottom of the fuselage behind the wing of the P-3C can be seen the launch tubes for the 48 sonobuoys, which are loaded from the outside while the aircraft is at rest. Four tubes connect with the interior, and can be reloaded while in flight.



Above: Iran was supplied with P-3 Orions before the Islamic revolution. Since that time, they have steadily been withdrawn from use due to lack of spares, but it is thought that several have seen action patrolling the Gulf during the war with Iraq.

purely surveillance nature. Accordingly, a variety of sensor systems (including radar, sonobuoys and a magnetic anomaly detector) are employed by crew members, and all of these systems provide data directly to the central computer for processing and display via a number of cathode ray tubes located in the cabin and on the flight deck. By eliminating the need to perform mathematical calculations and routine record-keeping, the computer has truly revolutionized the ASW mission, perhaps the most significant benefit being that crew members can now direct their attention almost entirely to the developing tactical situation.

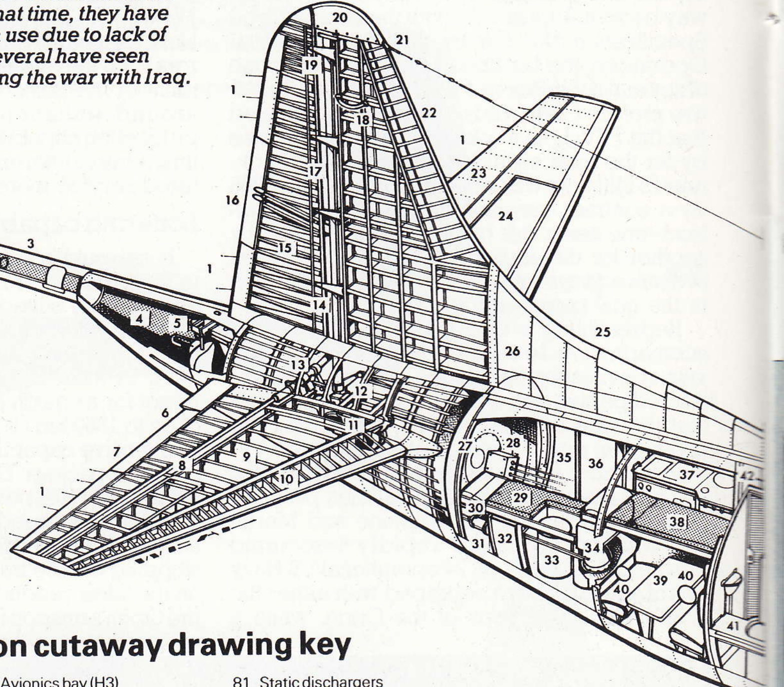
Of almost equal value is the fact that software relating specifically to a particular mission profile can also be prepared. Based on known navigation data and the latest intelligence reports, this software is loaded into the Orion's computer shortly before departure and once airborne can provide a reasonably accurate picture of the shipping situation likely to be encountered in the area under surveillance. Data-link facilities also enable up-to-the-minute information to be received or transmitted during the course of a mission, sources and recipients of such information being other ASW-dedicated aircraft and certain classes of surface vessel, the latter including aircraft-carriers.

Once the Orion has reached its area of operations, the tactical co-ordinator's station becomes the focal point of mission-related activity, this station featuring a large display unit capable of providing either ground-stabilized or aircraft-centred readings. Depending on requirements, this multi-purpose display can present a variety of data including wind direction and velocity, sonobuoy positions, range scale (varying from 3.7 to 2224 km/2.3 to 1,382 miles), aircraft heading and ground speed, as well as range and bearing to suspected targets. All of this data is automatically stored on magnetic tape and can be analysed once the mission is completed and the aircraft has returned to base. Thus, for example, in a training exercise, the mission profile can be replayed, permitting crew members more or less to re-enact their mission and learn what they did right and, perhaps more importantly, what they did wrong.

Sensor inputs are managed by the tactical co-ordinator, who has the added bonus of being able to direct the course of flight by means of relaying fly-points to the flight director indicator in the cockpit.

As far as detection capability is concerned, radar is the principal sensor used to observe surface vessels, while sonobuoys (of both active and passive types) are mainly employed in the hunt for submarines. Another important sensor in the search for the latter is the MAD (magnetic anomaly detector), which notes and reports on such variations in the Earth's magnetic field as might be caused by the presence of a submerged vessel or wreck.

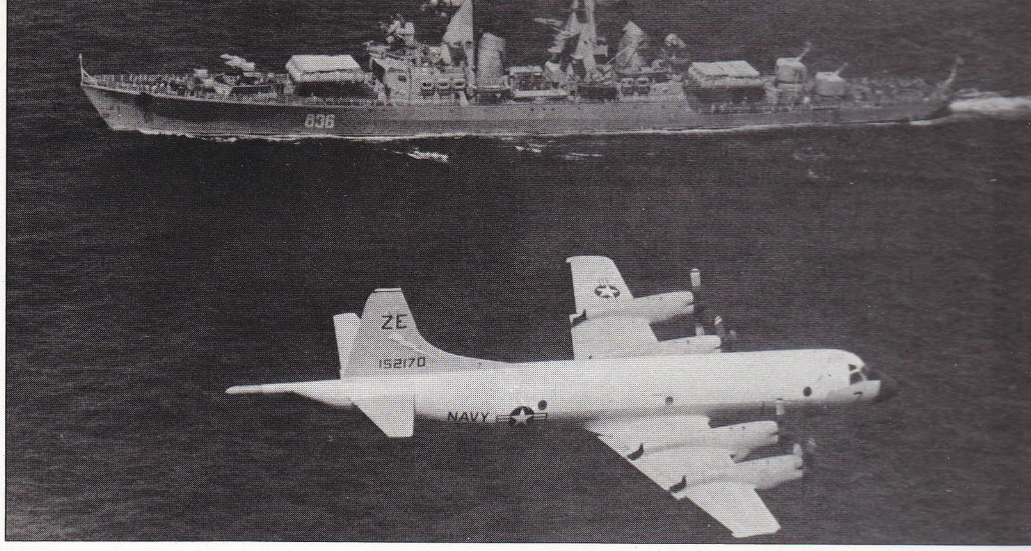
Stores management is also accomplished by computer, this being responsible for determining which sonobuoy will be launched and automatically selecting any one of 31 VHF channels used to monitor signals emanating from these sensors. Positional information pertaining to sonobuoys is also established by computer before display at the Tacco's station, and this device also looks after ordnance, selecting the weapon to be delivered and providing launch cues to the crew.



Lockheed P-3C Orion cutaway drawing key

1 Static dischargers
2 MAD detection head
3 MAD boom
4 Tail cone
5 APS-115 radar
6 Elevator trim tab
7 Starboard elevator
8 Elevator torque tube
9 Tailplane structure
10 Leading-edge hot air anti-icing
11 Elevator (starboard) and rudder (port) hydraulic booster units
12 Rudder linkage
13 Elevator tube universal joint
14 Rudder lower hinge
15 Rudder structure
16 Rudder trim tab
17 Rudder post
18 Antenna
19 Rudder upper hinge
20 Fin tip
21 Aerial attachment
22 Fin leading-edge
23 Port elevator
24 Port tailplane
25 Fin root fairing
26 Integral fin/rear fuselage
27 Aft pressure bulkhead
28 Tail unit anti-icing timer
29 Bunk (hinged: in-flight maintenance work bench beneath)
30 Elevator trim tab servo
31 Avionics bay (K2)
32 Avionics bay (K1)
33 Refuse bins (2)
34 KB-18 ventral camera (strike assessment)
35 Avionics bay (J2)
36 Avionics bay (J1)
37 Galley
38 Bunk (hinged)
39 Four-place dinette
40 Window ports
41 Lavatory
42 Avionics bay (H3)
43 Coat closet
44 Avionics bay (H2)
45 Avionics bay (H1)
46 Port observation station (screened compartment)
47 Starboard observation station (screened compartment)
48 Observation window
49 'A'-stores angle of release
50 'B'-store launchers (1)
51 'A'-store launchers (3)
52 Guard rail
53 Under-deck 'A'-store launchers (48)
54 Entry ladder (stowed in-flight position)
55 Main entrance door
56 Avionics bay (G2)
57 Avionics bay (G1)
58 Life-raft stowage (port)
59 Avionics bay (F2)
60 'A'-store stowage racks (36 stores)
61 Under-deck hydraulics service centre
62 Wingroot fairing
63 Ventral KA-74 camera
64 Avionics bay (F1)
65 Emergency exit (port)
66 Avionics bay (E2)
67 Avionics bay (E1)
68 Life-raft stowage (starboard)
69 Emergency exit (starboard)
70 Main electrical load centre (starboard)
71 Operators' seats
72 Sensor station 2 (acoustic)
73 Sensor station 1 (acoustic)
74 No. 2 fuel tank
75 Engine aft nacelles
76 Jet-pipe cooling-air inlets
77 Jet-pipe exhausts
78 HF aerial
79 Fowler-type flaps
80 Aileron trim tab
81 Static dischargers
82 Port aileron
83 Wingtip fairing
84 Port navigation light
85 Formation/identification light
86 No. 1 fuel tank
87 Integrally stiffened machined skin panels
88 Hot-air tapered ejector tubes ('piccolo' tubes)
89 Engine bleed air shut-off valve
90 Engine firewall
91 Nacelle cowling
92 Engine air intakes
93 Four-blade propellers
94 Spinners
95 Propeller cuffs
96 Oil cooler intake
97 ESM pod and pylon (mounted under port wingroot)
98 Oil cooler system
99 Engine oil cooling augmenter (jet pump) control valve
100 Starter control valve
101 Engine 14th stage bleed air taps
102 Engine bleed air shut-off valve
103 Fuselage bleed air shut-off valve (port and starboard)
104 Avionics bay (D3)
105 Sensor compartment centre-aisle curtain
106 Operator's seat
107 Window port
108 Sensor station 3 (non-acoustic)
109 Avionics bay (D2) (computer)
110 Avionics bay (D1)
111 Ditching station (13 places)
112 Avionics bay (B3)
113 Avionics bay (B2)
114 Avionics bay (B1)
115 Avionics bay (C3)
116 Avionics bay (C2)
117 Avionics bay (C1)
118 Observation window
119 Nav/com station
120 Bulkhead
121 Taco seat
122 Taco station
123 Antenna
124 Curtains/doorway to flight-deck
125 Flight crew emergency exit
126 Avionics bay (A1)
127 Pilot's seat
128 Flight engineer's seat
129 Overhead instrument console
130 Windshield
131 Instrument panel shroud
132 Control column
133 Forward pressure bulkhead
134 Radar support
135 Nose cone
136 APS-115 radar
137 Retractable FLIR
138 Pitot head
139 Nosewheel well beams
140 Rudder pedal

This brief look at some of the aspects of electronic wizardry available to the personnel who man the US Navy's large fleet of Orions might seem to indicate that they have not too much to do during a mission. Such an assumption would be erroneous, however, for the workload is still extremely high and ASW still has some way to go before it enters the totally automated age. Even then, it is highly unlikely that the number of aircrew members will decline, for there will probably always be a need for the old-fashioned 'mark one eyeball' which is still one of the most effective sensors around, while the human brain is streets ahead of even the most sophisticated computer when it comes to powers of reasoning.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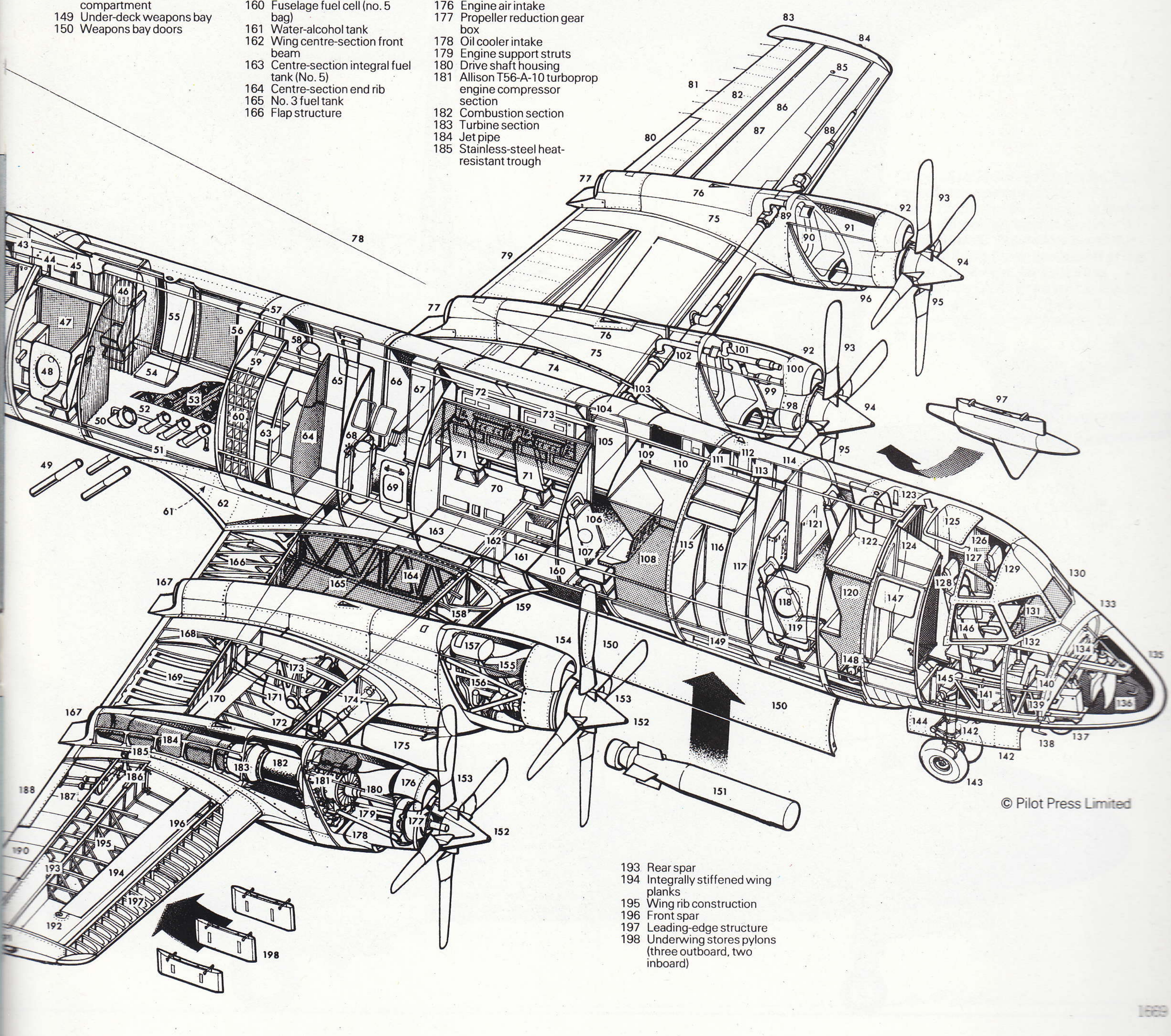
NAVY

Above: Typical of a day's work for the modern maritime patrol craft, this P-3B Orion of VP-17 was shadowing a Soviet 'Kynda' class guided missile cruiser. Often the first knowledge of new Soviet weapons comes from photos taken during such encounters.

141 Nosewheel retraction jack
142 Nosewheel doors
143 Forward-retracting twin nosewheels
144 Nosewheel leg torque link
145 Nosewheel leg pivot
146 Co-pilot's seat
147 Forward electrical load centre
148 Under-deck APU compartment
149 Under-deck weapons bay
150 Weapons bay doors
151 Bomb load (eight bombs)
152 Spinners
153 Four-blade propellers
154 Engine air intake
155 Intake trunking
156 Engine bearers ('V'-frame)
157 Oil tank
158 Inboard leading-edge section
159 Wingroot fillet
160 Fuselage fuel cell (no. 5 bag)
161 Water-alcohol tank
162 Wing centre-section front beam
163 Centre-section integral fuel tank (No. 5)
164 Centre-section end rib
165 No. 3 fuel tank
166 Flap structure
167 Jet-pipe exhausts
168 Flap profile
169 Bonded double skin
170 No. 4 fuel tank
171 Mainwheel well aft doors
172 Twin mainwheels
173 Mainwheel leg pivot
174 Retraction jack
175 Mainwheel well forward doors
176 Engine air intake
177 Propeller reduction gear box
178 Oil cooler intake
179 Engine support struts
180 Drive shaft housing
181 Allison T56-A-10 turboprop engine compressor section
182 Combustion section
183 Turbine section
184 Jet pipe
185 Stainless-steel heat-resistant trough
186 Aileron control linkage
187 Twin (fail-safe) trim actuators
188 Aileron trim tab
189 Static dischargers
190 Starboard aileron
191 Starboard navigation light
192 Formation/identification light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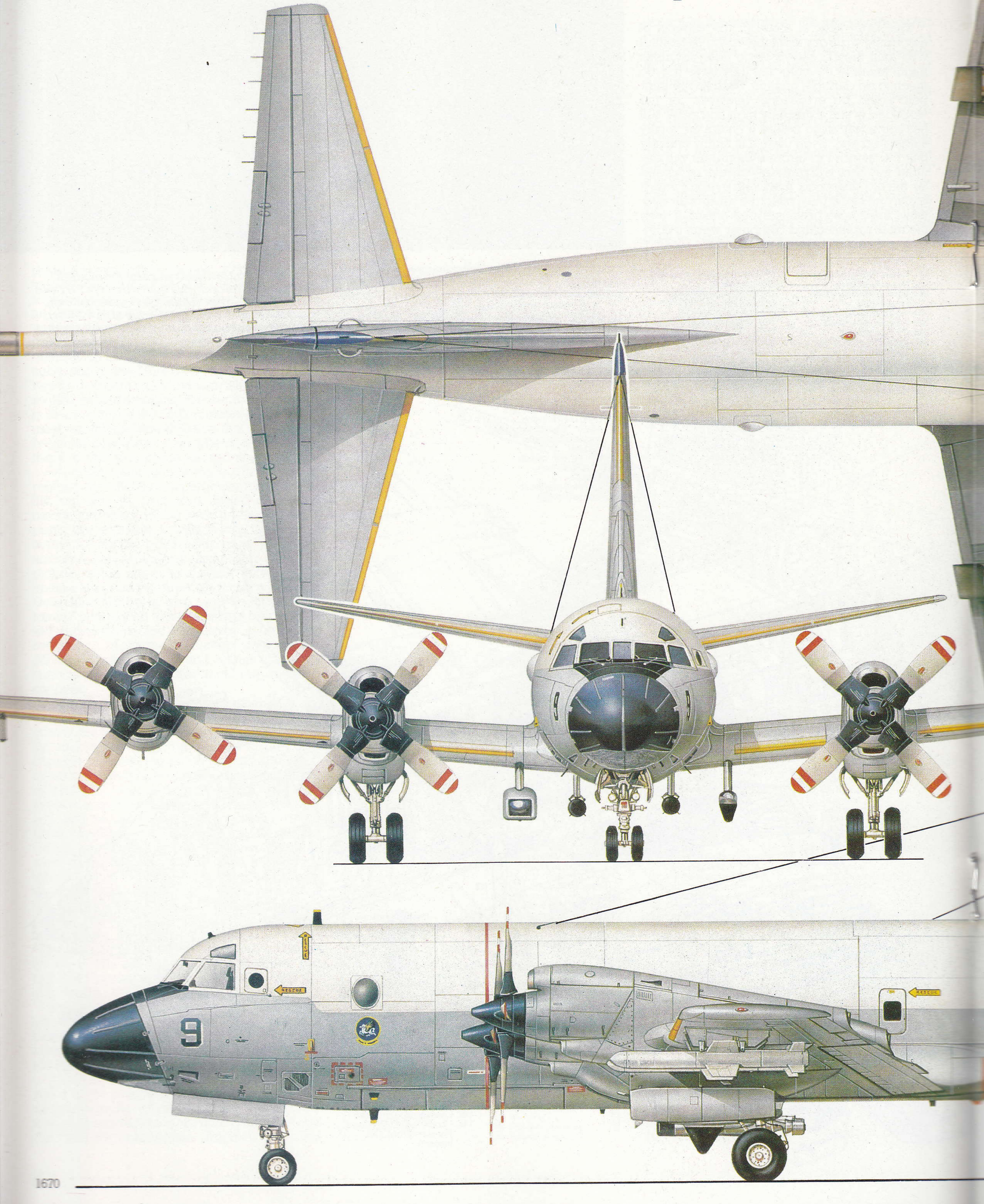
© Pilot Press Limited

193 Rear spar
194 Integrally stiffened wing planks
195 Wing rib construction
196 Front spar
197 Leading-edge structure
198 Underwing stores pylons (three outboard, two inboard)

Lockheed P-3C Orion Update II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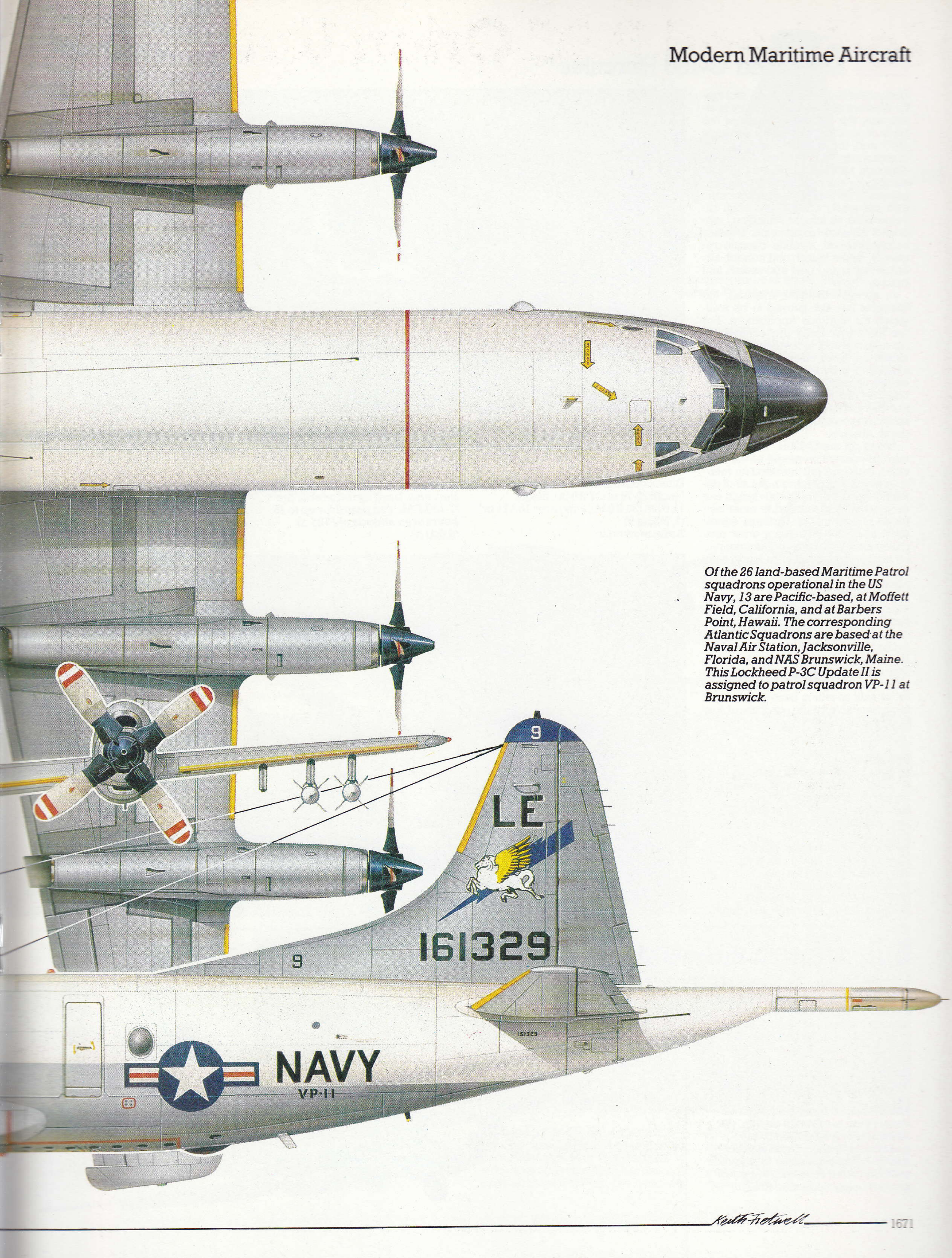
RESCUE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NAVY
VP-11
Keith Fretwell

Of the 26 land-based Maritime Patrol squadrons operational in the US Navy, 13 are Pacific-based, at Moffett Field, California, and at Barbers Point, Hawaii. The corresponding Atlantic Squadrons are based at the Naval Air Station, Jacksonville, Florida, and NAS Brunswick, Maine. This Lockheed P-3C Update II is assigned to patrol squadron VP-11 at Brunswick.

USA

Lockheed C-130 Hercules

Undoubtedly one of the most successful Western military aircraft of the post-war era, the **Lockheed Hercules** has been in continuous production since 1955 and the number built is now creeping up towards the 2,000 mark. Although designed primarily to fulfil airlift-type duties, the Hercules has proved to be a most versatile machine and presently undertakes such diverse tasks as inflight-refuelling, support of Antarctic exploration, weather reconnaissance, satellite capsule recovery, drone launch and control, airborne command post and search and rescue.

In addition to these missions, the Hercules has also proved to be well-suited for maritime applications. For the most part these are confined to surveillance and, indeed, the maritime Hercules lacks offensive capability although it is by no means beyond the realms of possibility that it could eventually be reconfigured in order to permit the carriage of dedicated anti-submarine warfare weaponry such as depth charges.

Based on the **C-130H**, which is the current production model of the Hercules, those aircraft intended for maritime tasks incorporate a number of detail changes, but the basic design can be more or less tailored to meet customer requirements. Optional equipment available includes a crew rest/galley module; a ramp equipment pallet containing rescue kit, a loudspeaker, flare launchers and an aft-facing observation platform; specialized sea search radar; advanced navigation equipment; searchlights; system interfaces for camera and data annotation gear; and observation stations in the cabin area. In addition, of course, the Hercules can also undertake airlift-type duties with equal facility, a factor which must be particularly attractive to those nations which have only limited funds available for the purchase of new equipment.

Specification

C-130H (maritime configuration)
Type: medium/long-range cargo/maritime surveillance aircraft
Powerplant: four 3361.6-kW (4,508-shp) Allison T56-A-15 turboprop engines
Performance: maximum cruising speed 621 km/h (386 mph); patrol range with auxiliary fuel at surveillance altitude of 1524 m (5,000 m) 4661 km (2,896 miles)
Weights: zero fuel in typical maritime configuration 39945 kg (88,064 lb); maximum normal take-off 70307 kg (155,000 lb); maximum overload take-off 79379 kg (175,000 lb)
Dimensions: span 40.41 m (132 ft 7 in); length 29.79 m (97 ft 9 in); height 11.66 m (38 ft 3 in); wing area 162.11 m^2 (1,745 sq ft)
Armament: none

Above: Given the astonishing range of tasks it has performed in its 30-year career, it is hardly surprising that there should be a maritime surveillance version of the Lockheed Hercules. Used by Indonesia, the C-130H-MP can patrol for up to 16 hours at an altitude of 1525 m (5,000 ft).

Below: The US Coast Guard has more than 20 HC-130 Hercules, although some of the earlier models are in storage. The HC-130H is an extended range model originally used by the Air Force Aerospace Rescue & Recovery Service, with 12 subsequently produced for the US Coast Guard.

USCG
COAST GUARD
1600

FRANCE

Dassault-Breguet Atlantic

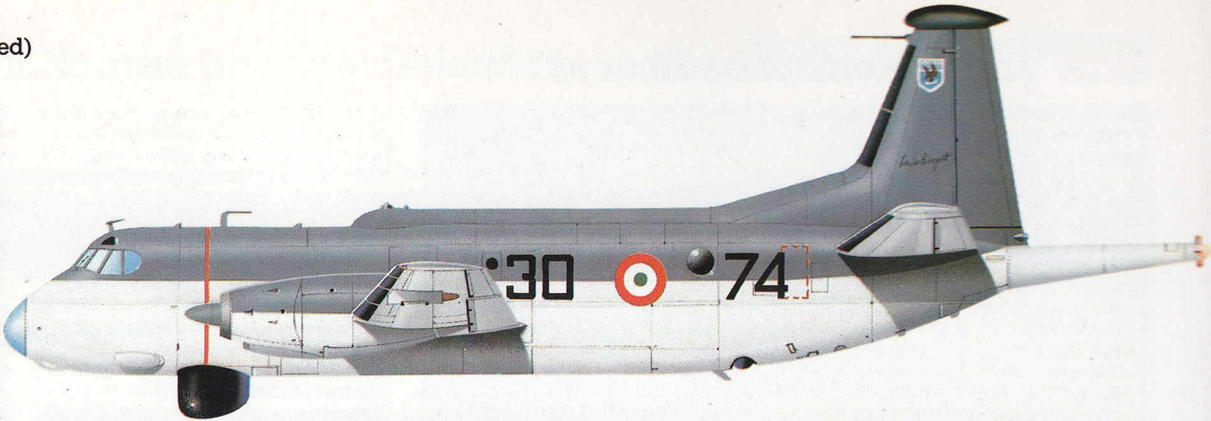
The **Dassault-Breguet Atlantic** stemmed from the **Breguet Br 1150**, the winning design in a 1958 NATO contest for a new maritime patrol aircraft to succeed the Lockheed Neptune. Though the choice was approved by all 15 NATO members in December 1958, and ordered into production by a multinational consortium called SECBAT,

61 04 MARINE

Manufactured by an international consortium to a French design, the Atlantic is only operated in any quantity by France, Germany and Italy. Germany operates 14 Atlantics in the maritime role, with five more aircraft being dedicated to Elint.

Dassault-Breguet Atlantic (continued)

the Atlantic was bought by only a few countries, notably excluding the UK and the USA, and Belgium whose industry had a major share in SECBAT. Other partners, apart from the parent firm, were Sud-Aviation, Dornier and Fokker. Italy joined after placing an order, and the British engines and propellers were likewise shared out among participating nations. The prototype flew on 21 October 1961 and deliveries began in December 1965, totalling 87 for France (37), West Germany (20), Italy (18), Netherlands (9) and Pakistan (3). Skinned largely with aluminium honeycomb sandwich, the Atlantic has a capacious double-bubble fuselage, an efficient long-span wing, and comprehensive avionics managed by a crew of 12. Five German machines are ECM platforms. On 8 May 1981 Dassault-Breguet flew the first **ANG (Atlantic Nouvelle Génération)** with completely updated avionics and improved structure. France expects to buy 42 ANGs (now known as the **Atlantique**) made by the same SECBAT consortium, and other orders are being sought.



The 27 Atlantics currently in service form the backbone of France's maritime reconnaissance strength. The new Atlantique was first flown in May 1981, and 42 have been ordered by the Aéronavale. The new model features a strengthened structure and new avionics.

Specification
Atlantique
Type: maritime patrol and ASW aircraft
Powerplant: two 4638.3-ekW (6,220-ehp) Rolls-Royce Tyne 21 turboprops made by multinational group
Performance: maximum speed at sea level 592 km/h (368 mph), and at 6096 m (20,000 ft) 658 km/h (409 mph); range 8150 km (5,065 miles); endurance 18 hours
Weights: empty 25300 kg (55,777 lb); maximum take-off 46200 kg (101,854 lb)
Dimensions: span (over ESM pods) 37.30 m (122 ft 4.5 in); length 32.62 m (107 ft 0.25 in); height 11.35 m (37 ft 2.9 in); wing area 120.34 m^2 (1,295.3 sq ft)
Armament: unpressurized weapon bay houses all NATO bombs, torpedoes (8), depth charges, mines and missiles, a typical load being one AM39 Exocet plus three AS torpedoes; four wing pylons for 3500 kg (7,716 lb) of stores including pods, containers, rockets or ASMs

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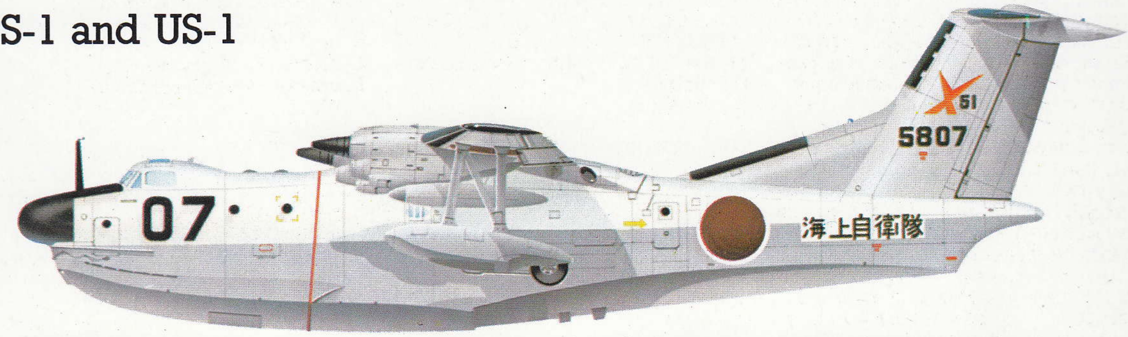
JAPAN

Shin Meiwa PS-1 and US-1

Today the great fleets of military flying-boats and amphibians have all but vanished, and the only type recently in production is the **Shin Meiwa SS-2** family which was produced as the **PS-1** and **US-1** for the JMSDF (Japan Maritime Self-Defence Force). The company was famed as that wartime builder of marine aircraft, Kawanishi, and when it received a 1966 contract for an ASW (anti-submarine warfare) flying-boat it produced a very advanced design with four turboprops for propulsion and a fifth gas turbine to provide high-pressure air for boundary-layer control blowing over the flaps, rudder and elevators. This enables the aircraft to fly extremely slowly under full control and also greatly reduces take-off and alighting distances. The first SS-2 (PS-1) flew in October 1967, and eventually 23 production machines were delivered, 19 of these remaining operational with the JMSDF 31st Air Group at Iwakuni. The PS-1 has a crew of 10, comprising two pilots, flight engineer, navigator, two sonar operators (sonar can be repeatedly dipped in rough seas after alighting), MAD operator, radar and radio operators and tactical co-ordinator. A beaching chassis is permanently attached and the PS-1 can taxi ashore under its own power. The **SS-2A** amphibian, on the other hand, has full tricycle landing gear, and eight were delivered as US-1 search/rescue aircraft with a crew of nine and room for either 20 seated survivors, 12 stretcher (litter) casualties or 69 ordinary passengers.



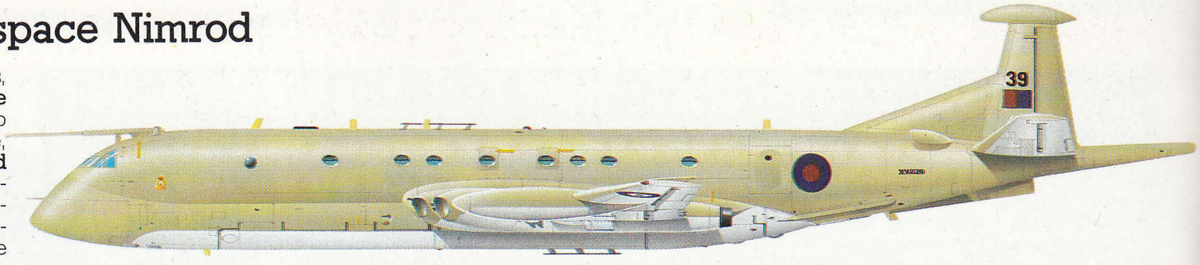
Whilst on patrol the PS-1 makes repeated landings and take-offs, dipping its sonar after alighting. This can be accomplished in seas with up to 3 m (10 ft) waves.

Specification
PS-1
Type: ASW flying-boat
Powerplant: four 2281.8-ekW (3,060-ehp) General Electric T64-IHI-10 turboprops (made under licence by IHI)
Performance: maximum speed 547 km/h (340 mph); range at low altitude with maximum weapons 2168 km (1,347 miles)
Weights: empty 26300 kg (57,982 lb); maximum 43000 kg (94,799 lb)
Dimensions: span 33.14 m (108 ft 8.7 in); length 33.50 m (109 ft 10.9 in); height 9.71 m (31 ft 10.3 in); wing area 135.82 m^2 (1,462 sq ft)
Armament: internal weapon bay for four 149-kg (328-lb) AS bombs and extensive search gear, two underwing pods for four Mk 44 or 46 homing AS torpedoes and triple launcher under each wingtip for 127-mm (5-in) rockets

A highly advanced wing and engine combination gives the Shin Meiwa PS-1 and the amphibious US-1 very good STOL and low speed handling capabilities.

UK

British Aerospace Nimrod



Nimrod's latest MR.Mk 2P guise has a hemp colour scheme and an inflight-refuelling probe added.

After many years studying other ideas, the RAF picked the **British Aerospace Nimrod** as its replacement for the Avro Shackleton in the maritime patrol role, and the first production **Nimrod MR.Mk 1** flew on 28 June 1968. Features include an enormously capacious fuselage with a very large unpressurized lower lobe housing the radar, weapon bays and much systems equipment. Flight is possible on any one of the four fuel-efficient turbofan engines, the outers having reversers to back up the anti-skid brakes on the bogie main gears and enormous plain flaps. The normal crew comprise 12, who have an outstandingly complete and well integrated array of sensors, data processing and navigation/communication/identification systems for ASW, SAR, Elint, reconnaissance and other tasks for surface forces and even transport with accommodation for 45 passengers in the rear compartment. The 43 Nimrod MR.Mk 1 aircraft established an outstanding record, only one being lost in 10 years of intensive operation, mainly in extremely adverse conditions and at very low levels.

Three **Nimrod R.Mk 1** aircraft serve in the dedicated Elint role. From 1979 a total of 32 Nimrod MR.Mk 1s have been rebuilt as **Nimrod MR.Mk 2** with completely upgraded avionics, sensors and data-processing. A total of 11 further aircraft are being delivered as **Nimrod AEW.Mk 3** AWACS type aircraft, with Marconi pulsed-Doppler surveillance radar of extremely advanced type using nose and tail aerials each scanning 180° with perfect visibility. The Nimrod AEW.Mk 3 is compatible with all E-3A Sentries and should enter service with No. 8 Squadron, RAF, in 1986.

Specification

Nimrod MR.Mk 2

Type: maritime patrol aircraft

Powerplant: four 5507-kg (12,140-lb) thrust Rolls-Royce Spey 250 turbofans

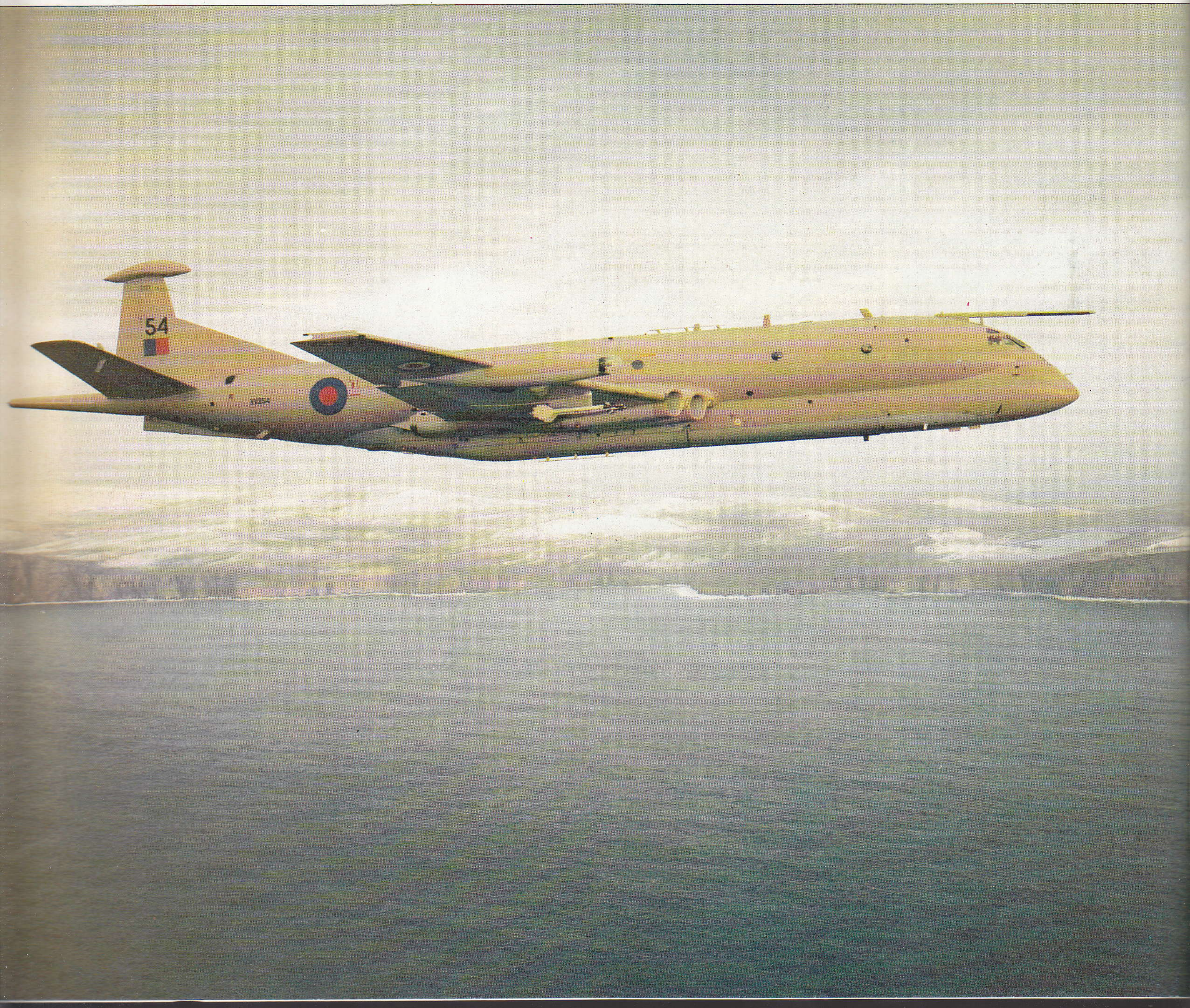
Performance: maximum speed 926 km/h (575 mph); patrol speed on two engines 370 km/h (230 mph); range 9262 km (5,755 miles); endurance 18 hours

Weights: empty 39009 kg (86,000 lb); maximum take-off 87090 kg (192,000 lb)

Dimensions: span 35.0 m (114 ft 10 in); length 38.63 m (126 ft 9 in); height 9.06 m (29 ft 8.5 in); wing area $197\ m^2$ (2,121 sq ft)

Armament: 14.78 m (48 ft 6 in) weapon bay carries six lateral rows of stores including nine torpedoes as well as bombs; provision for wing pylons for ASMs or other stores; very comprehensive ASW sensor systems

Nimrods were given a limited self-defence capability during the Falklands campaign by the addition of AIM-9L Sidewinders under the wings; these were also to be used against Argentine Boeing 707s which were patrolling the same oceans. This aircraft is an MR.Mk 2P with inflight-refuelling probe.



UK

Pilatus Britten-Norman Maritime Defender

The British firm Britten-Norman flew a prototype of the highly successful **Britten-Norman BN-2 Islander** nine-passenger light transport in 1965. A rugged aircraft with fixed landing gear, it has also been produced in the Philippines, Romania and Belgium, although the parent company at Bembridge, Isle of Wight, is now Swiss-owned. Several air arms adopted the Islander for personnel and freight transport, including five delivered to the Indian Navy in 1976. Later, these aircraft were modified with a nose-mounted radar for maritime patrol duties, being augmented in 1981-3 by a further dozen to the same standard. Similarly, the Philippine navy operates five locally-built Islanders in the surveillance role.

The next stage in development was the **Defender**, built to military standards and with optional fitments including four underwing weapon pylons and a weather radar in the nose to provide a simple maritime-search capability. Low cost has resulted in considerable sales, especially to Third World countries. To meet the specialized maritime requirement more fully, the manufacturer has introduced the **Maritime Defender**, the main feature of which is a Bendix RDR 1400 radar providing an enhanced search range: 67 km (41.5 miles) for a 100-m^2 (1,076-sq ft) object in sea state 4-5. The nose radome increases fuselage length from the standard 10.86 m (35 ft 7.75 in), and the antenna scans 60° to each side, giving a search band of 111 km (69 miles) at optimum altitude. For day or night operations in coastal patrol, fishery protection and SAR roles, the aircraft carries a pilot, a co-pilot, a radar operator and two observers, together with such aids as Omega navigation, a radio altimeter and a transponder. Wing pylons are retained for SAR kits as well as more warlike loads such as BAe Sea Skua anti-ship missiles, Marconi Stingray homing torpedoes, self-defence AIM-9 Sidewinder AAMs and a range of ECM/ESM pods. An optional searchlight and hand-held camera are available for fishery and other policing tasks. Customers may opt for the **Turbine Defender** version, powered by two 238.6-kW (320-shp) Allison 250-B17C turboprop engines.

Specification

Maritime Defender

Type: armed maritime surveillance aircraft

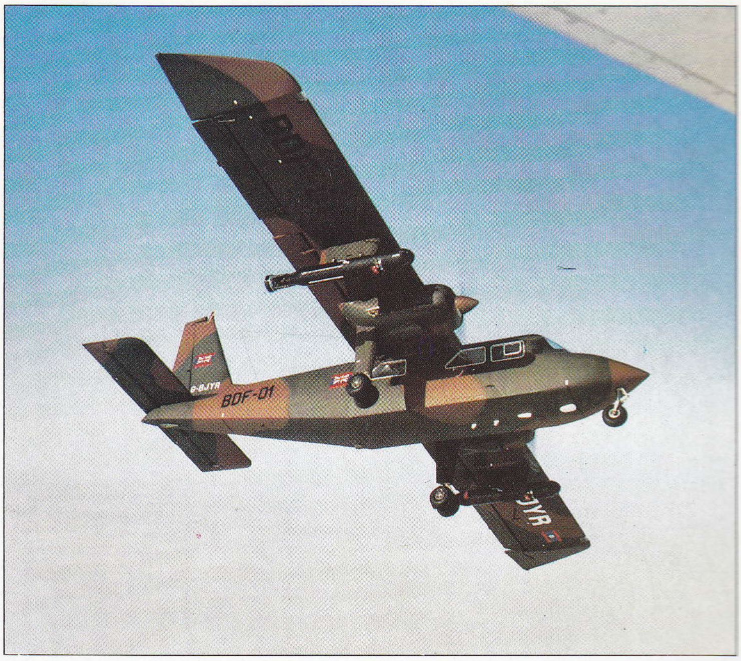
Powerplant: two 193.9-kW (260-hp) Avco Lycoming O-540-E4C5 flat-six piston engines

Performance: maximum speed, clean 280 km/h (174 mph); initial climb rate 396 m (1,300 ft) per minute; service ceiling 5182 m (17,000 ft); range with maximum payload 673 km (418 miles)

Weights: empty 1823 kg (4,020 lb); maximum take-off 2994 kg (6,600 lb)

Dimensions: span 14.94 m (49 ft 0 in) standard, or 16.15 m (53 ft 0 in) optional; length 11.07 m (36 ft 3.75 in); height 4.18 m (13 ft 8.75 in); wing area 30.19 m^2 (325.0 sq ft) or 31.31 m^2 (337.0 sq ft)

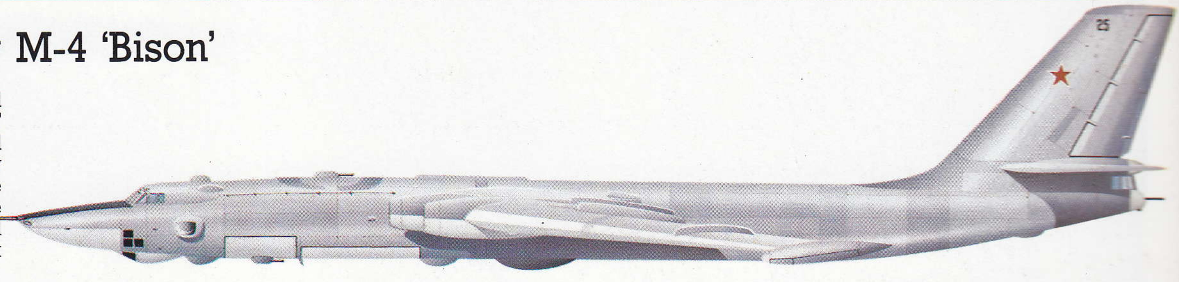
Armament: various missiles and bombs on four underwing pylons



Pilatus Britten-Norman's Defender provides a low-cost alternative for a maritime aircraft. This example flies with the Benin Defence Force on maritime duties, armed with torpedoes under the wings.

USSR

Myasishchev M-4 'Bison'



'Bison-C' is the main maritime version of the M-4, which features an elongated nose containing more capable radar. 'Bison-B' was the earlier maritime version.

Now in the twilight of its operational career, the **Myasishchev M-4 'Bison'** entered the design stage in 1951 and was first seen airborne in a May Day flypast over Moscow in 1954. Service deliveries began in 1956, and with the nickname **'Molot'** (hammer) it gained the distinction of being the USSR's first operational four-jet strategic bomber. V.M. Myasishchev had previously been a leading light in the Tupolev bureau, and this product emerged as a robust, yet innovative aircraft which met most aspects of an extremely demanding strategic bomber specification. Similar in many respects to early models of the Boeing B-52, the **'Bison-A'** numbered among its achievements a world record speed 1028 km/h (639 mph) in a 1000-km (621-mile) closed circuit carrying a 27000-kg (59,525-lb) payload. Perhaps 200 of the type were built, of which 40 remain as bombers and 30 have been fitted as inflight-refuelling tankers.

A maritime version, the **'Bison-B'** was first observed in 1964, being distinguished by a solid nose radome with attached inflight-refuelling probe, a bulge in the forward portion of the centre bomb bay doors, and a comprehensive sensor fit betrayed by several blister fairings beneath the fuselage. The original upper and lower rear fuselage gun turrets were removed, leaving six NR-23 cannon for self-defence. The improved **'Bison-C'** continued the MR theme, but its improved search radar was contained in a new, longer nose and a prone bombing position with an optically flat windscreen was added in the floor of the cockpit. In addition, more small windows and a domed observation and gun-aiming position were added to each side of the fuselage, although the belly retained the same modification as the 'Bison-B'. As such, the 'Bison-C' version is available for reconnaissance, Elint, electronic warfare and mid-course guidance of long-range anti-ship missiles. The 'Bison-A' and perhaps a small number of 'Bison-Bs' and 'Bison-Cs' of the Soviet naval air force remain in use.

Specification

M-4 'Bison-C'

Type: maritime reconnaissance bomber

Powerplant: four 13000-kg (28,660-lb) thrust Soloviev D-15 turbojets

Performance: maximum speed 1005 km/h (624 mph) or Mach 0.945 at 11000 m (36,089 ft); unrefuelled radius of action 5600 km (3,480 miles)

Weights: empty about 83900 kg (184,968 lb); maximum take-off 210000 kg (462,971 lb)

Dimensions: span 52.50 m (172 ft 2.9 in); length excluding probe 49.38 m (162 ft 0 in); height 14.24 m (46 ft 8.7 in); wing area 320.0 m^2 (3,444.6 sq ft)

Armament: six NR-23 23-mm cannon in dorsal, tail and ventral barbettes

The Mysasishchev M-4 heavy bomber, known by the NATO reporting name 'Bison', was the first Soviet four-jet operational heavy bomber. With an unrefuelled combat radius of over 5600 km (3,480 miles), it proved suitable for the maritime reconnaissance and attack roles, and two dedicated MR versions were produced.

USSR

Tupolev Tu-16 'Badger'

Bearing the Tupolev designation Tu-88, this strategic jet bomber first flew in late 1952. **'Badger-A'** bomber versions were in service by 1954 and these were followed by **'Badger-B'** and **'Badger-G'**, which could carry two stand-off air-to-surface missiles under the wings. **'Badger-C'** is an anti-shipping version with a 'Kipper' missile carried in a recess under the fuselage (some now have pylons for 'Kingfish' missiles under the wings). There have been many maritime reconnaissance, Elint and ECM variants: the **'Badger-D'** maritime reconnaissance platform with large undernose radar, **'Badger-E'** with cameras in bomb bay, **'Badger-F'** with Elint pods carried under the wings, **'Badger-H'** specialist ECM aircraft with primary chaff-dispensing function, **'Badger-J'** specialist electronic jamming aircraft and **'Badger-K'** electronic reconnaissance aircraft. All these versions are widely seen around Western naval forces, and also make electronic intelligence flights around the coasts of NATO countries, eavesdropping on communications. Support is provided by Tu-16 tankers, which refuel other 'Badgers' by the wingtip-to-wingtip method. About 400 Tu-16s remain in service with the AV-MF (naval aviation).

Specification

Type: strategic bomber, missile platform, maritime reconnaissance, ECM and Elint aircraft

Powerplant: two 8700-kg (19,200-lb) Mikulin AM-3M turbojets

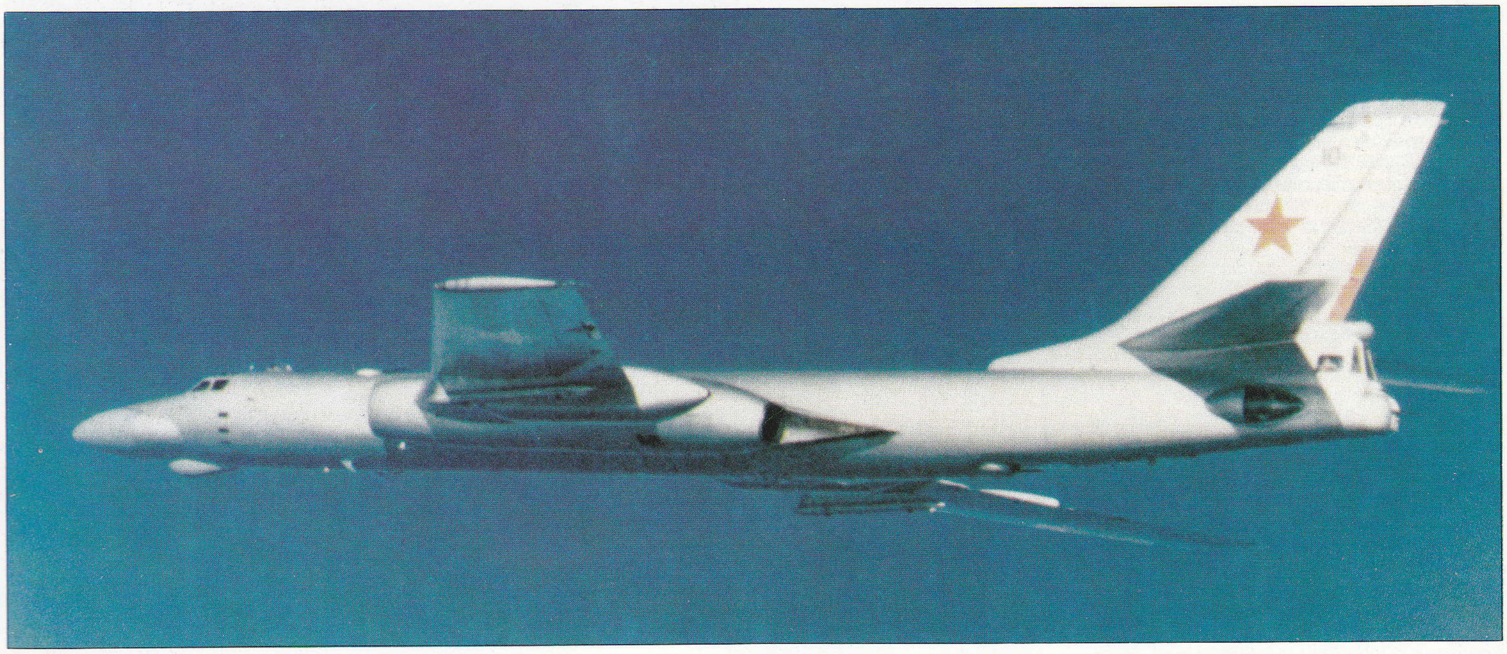
Performance: maximum speed 1000 km/h (620 mph); cruising speed 850 km/h (530 mph); service ceiling 14000 m (46,000 ft); maximum range 6400 km (4,000 miles)

Weights: empty 3600 kg (80,000 lb); maximum take-off 72000 kg (158,500 lb)

Dimensions: wing span 34.54 m (113 ft 3 in); length 36.5 m (120 ft); height 10.8 m (35 ft 6 in); wing area 170 m^2 (1,820 sq ft)

Armament: all versions have seven 23-mm NR-23 cannon: one fixed in forward fuselage, two in tail turret and two each in ventral and dorsal barbettes; ('Badger-C') one AS-2 'Kipper', ('Badger-G') two AS-5 'Kelt' or one AS-6 'Kingfish' air-to-surface missiles; bomber versions have provision for 6000 kg (13,000 lb) of internal stores

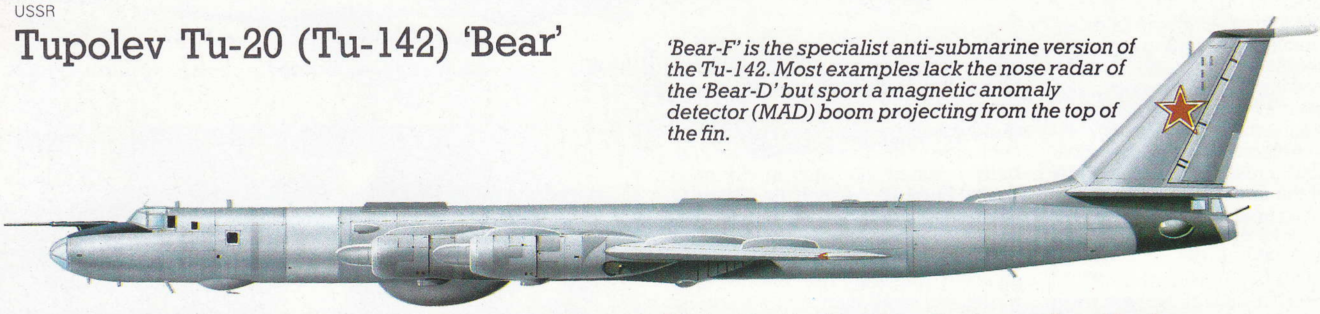
Anti-shipping and reconnaissance versions of the Tu-16 are widely seen around NATO ships and coastlines. This 'Badger-C' carries a large radar under the nose, and has pylons under the wings for anti-ship missiles.



USSR

Tupolev Tu-20 (Tu-142) 'Bear'

'Bear-F' is the specialist anti-submarine version of the Tu-142. Most examples lack the nose radar of the 'Bear-D' but sport a magnetic anomaly detector (MAD) boom projecting from the top of the fin.



Designed as a strategic nuclear bomber, the **Tupolev Tu-20** first flew in 1954 and was initially regarded in the West as an aircraft of little promise. Having the design bureau project number **Tu-95**, it was essentially a swept-wing version of the Tu-85 with four turboprop engines driving contra-rotating four-blade propellers of massive 5.6 m (18 ft 4.5 in) diameter. At a time when turbojet bombers were proliferating, the engine configuration caused the design to be assessed as obsolescent, and not until later did the West appreciate the remarkable range and bombload capabilities of the aircraft. Accommodating up to 16 personnel, comprising two crews, the Tu-20 received the NATO reporting name **'Bear'** and was found to be capable of flying over 160 km/h (99 mph) faster than the supposed maximum speed for a propeller driven aircraft of its size.

Main production of the 'Bear' ended in 1961-2 after approximately 300 aircraft, although a dozen or so were produced annually for the next 20 years to maintain force levels. Currently, the Soviet air force (V-VS) has about 115 Tu-20s (a little more than half the remaining aircraft) of the **'Bear-A'**, **'Bear-B'**, **'Bear-C'** and **'Bear-G'** variants for free-fall bombing or carrying cruise missiles. Production of new **'Bear-H'** aircraft at the Taganrog plant began recently in order to provide a carrier for the AS-15 cruise missile.

Maritime reconnaissance versions of the 'Bear' have the bureau designation **Tu-142**, this number having been revived and used in preference to Tu-20 in order to identify naval models exempt from the 1979 SALT-2 arms-control talks. These comprise 45 **'Bear-D'** aircraft with a large I-band radome under the belly; a small number of **'Bear-E'** aircraft equipped with cameras in the bomb bay; and 50 **'Bear-F'** aircraft for anti-submarine duties. The last-mentioned is a revised design with changes including a 2.00 m (6 ft 6.75 in) fuselage extension forward of the wings. Other 'Bears' have been noted with a variety of special sensor equipment fitments and three, designated **Tu-142M**, are due for delivery to the Indian Navy in 1985 for ASW duties as the sole exports of the Tu-20 series. Despite its age, the 'Bear' remains an effective reconnaissance aircraft and will continue to serve Soviet naval aviation (AV-MF) for some time to come. Western observers speculate that its 'replacement' could prove to be a prop-fan version of the same basic design.

Specification

Tu-20 (Tu-142) 'Bear-F'

Type: long-range maritime reconnaissance aircraft

Powerplant: four 11032.6-kW (14,795-shp) Kuznetsov NK-12MV turboprops

Performance: maximum speed 925 km/h (575 mph) at 12500 m (41,010 ft); maximum unrefuelled range (bomber) 12550 km (7,798 miles)

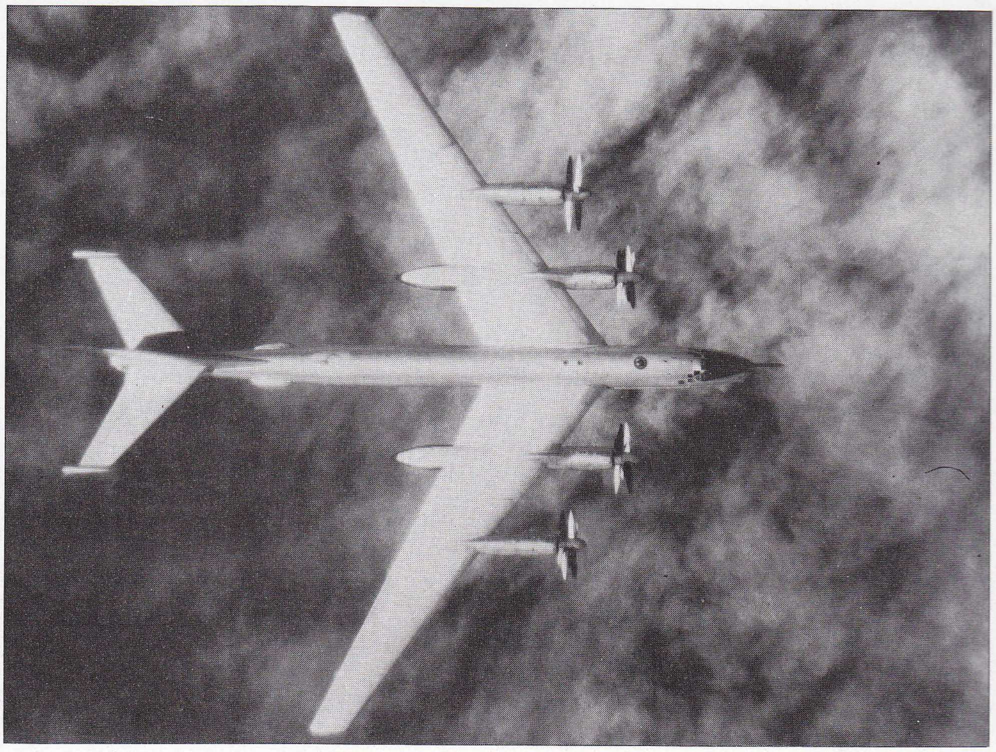
Weight: maximum take-off about 188000 kg (414,469 lb)

Dimensions: span 51.10 m (167 ft 7.8 in); length 49.50 m (162 ft 4.8 in); height 12.12 m (39 ft 9.2 in); wing area 310.5 m^2 (3,342.3 sq ft)

Armament: two NR-23 23-mm self-defence cannon in tail turret, plus depth charges, bombs and torpedoes

Shadow of the Bear

In production for over 30 years, the giant Tupolev design known as the 'Bear' has become a familiar sight over the oceans of the world. There can be few sailors who have taken part in a large exercise who have not felt the shadow of the 'Bear'.



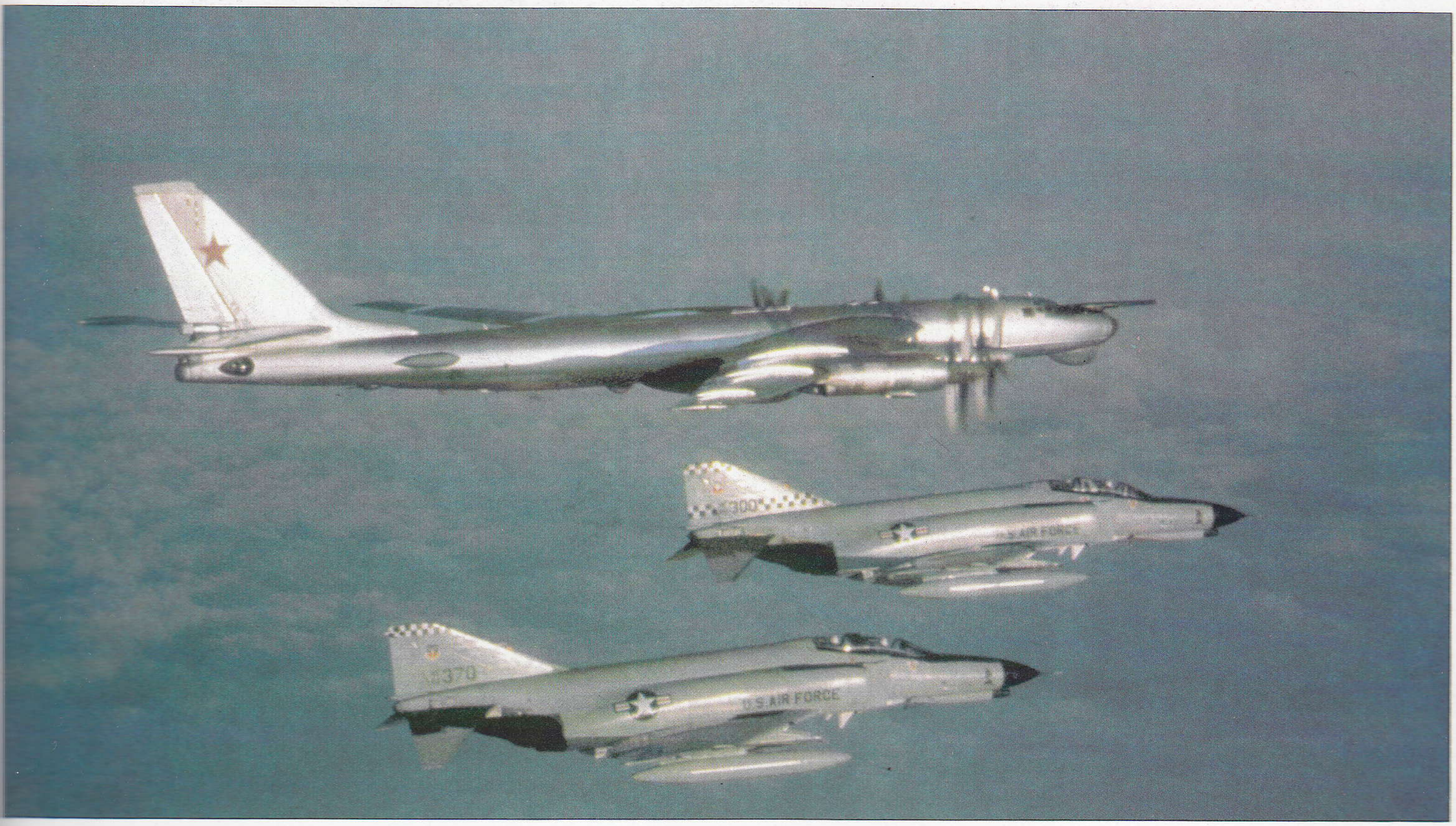
Below: A plan view of the 'Bear-D' shows the unique configuration of swept wing and massive turboprop engines driving four enormous sets of contra-rotating propellers.

The bear is, in its animal form, often used to represent the Soviet Union, and so it was perhaps fitting that NATO allocated the reporting name 'Bear' to Tupolev's Tu-20 bomber when it first appeared in the mid-1950s. Like the USSR, the 'Bear' is a giant; and in apparent confirmation of Western opinions of its country of origin, it appeared to be a backward design. Now, over three decades later, the immense range capability of the 'Bear', even without use of its inflight refuelling probe, has pressed home the fact that it is still a valuable asset in maritime reconnaissance. Like Soviet influence, 'Bears' will be found throughout the globe and, indeed, the aircraft is partly responsible for the USSR's current presence at strategic points on and under the world's oceans.

Although used by the Soviet air force from late 1956 as a strategic bomber (and later as a cruise missile carrier) the 'Bear' was not positively identified in naval guise until 1967, when two overflew US Coast Guard vessels in the Arctic. Designated 'Bear-D', these were seen to have an immense I-band search radar scanner beneath the belly, this being christened 'Big Bulge' by the NATO Air Standards Coordinating Committee. The name was appropriate, for this was the largest radar carried aloft until the advent of AWACS aircraft. Among a plethora of other electronic sensors and aerials, the 'Bear-D' has a 'Short Horn' navigation (with bombing capability) J-band radar below the extreme nose, while in some sub-variants the tail turret is replaced by further electronic equipment. About 45 'Bear-Ds' remain in service, one of their main tasks being to pinpoint targets for missiles launched by ships or aircraft too far away to locate the enemy with their own radars.

The 'Bear-E' is a rebuild of the 'Bear-A' for strategic reconnaissance, incorporating an in-

Below: 'Bear-D' is the most seen version over international waters, and frequently undertakes flights in the North Atlantic, flying from its bases on the Kola Peninsula to airfields in Cuba. These are frequently intercepted by the F-4E Phantoms of the 57th Fighter Interceptor Squadron from Iceland.



flight-refuelling probe, six (occasionally seven) cameras in the bomb bay, and electronic sensors. Finally, in 1973, the 'Bear-F' was identified. This is a long-range anti-submarine version featuring a lengthened fuselage, a revised flightdeck with raised canopy, a smaller I-band radome mounted further forward than on the 'Bear-D', only optional fitment of J-band radar in a modified undernose housing, and a comprehensive array of sonic processing equipment. Some 50 of this version are in use.

With its immense size, long range and respectable turn of speed, the 'Bear' was ideally suited to the patrol of vast ocean tracts far from base. The foundation of this work was laid in Nikita Khrushchev's announcement in January 1960 of a new military doctrine in which the submarine would take pride of place amongst naval weaponry, followed by the AV-MF (Naval Aviation), with surface vessels and other units assigned lesser importance. As the fleet has grown from a coastal protection force into a 'blue water navy', so has the 'Bear' increased its surveillance activities from an ever larger number of bases.

Defensive patrols

In the defensive role, however, 'Bears' patrol the waters around the Soviet Union on the lookout for foreign ships and submarines, just as would any naval air force. The aircraft also keep watch over the regular exercise areas of the Soviet navy, although possibly they have little to do with the Black Sea and Baltic Fleets which operate in the restricted home waters that can be covered by the Ilyushin Il-38 'May'. More extensive operational areas are enjoyed by the Pacific and Northern Fleets, the latter being responsible for the 12000-km (7,456-mile) Arctic coastline and operation of the greater proportion of the USSR's nuclear submarines.

Operating from Murmansk, the Northern Fleet includes the waters off Norway as its training ground, while elements regularly enter the North Atlantic via the Iceland-Faroes gap, this being the fleet's expected main thrust line in wartime. 'Bears' flying from bases on the Kola peninsula as part of the 425-strong naval air element of the Northern Fleet support these operations. The position in the Pacific is much the same, with patrols being regularly undertaken of the Bering and Okhotsk Seas as well as the more sensitive Sea of Japan. Some 440 naval aircraft of all types are based in this area, 'Bears' included.

But 'Bears' are also to be seen over waters not immediately relevant to defence of the Soviet Union. Surveillance of shipping movements and gathering electronic intelligence over a wide area are essential activities for any major power, as is the tangible provision of support for friendly Marxist states in Central America, Africa and South East Asia. When RAF fighters are scrambled to intercept an unknown aircraft flying towards the North Sea or through the Iceland-Faroes gap, the target is as likely as not to be identified as a 'Bear' on a regular surveillance flight. Special sorties are flown when there is a NATO naval exercise to be observed, while other intercepts may be of 'Bears' going to and from rotational duty in Cuba.

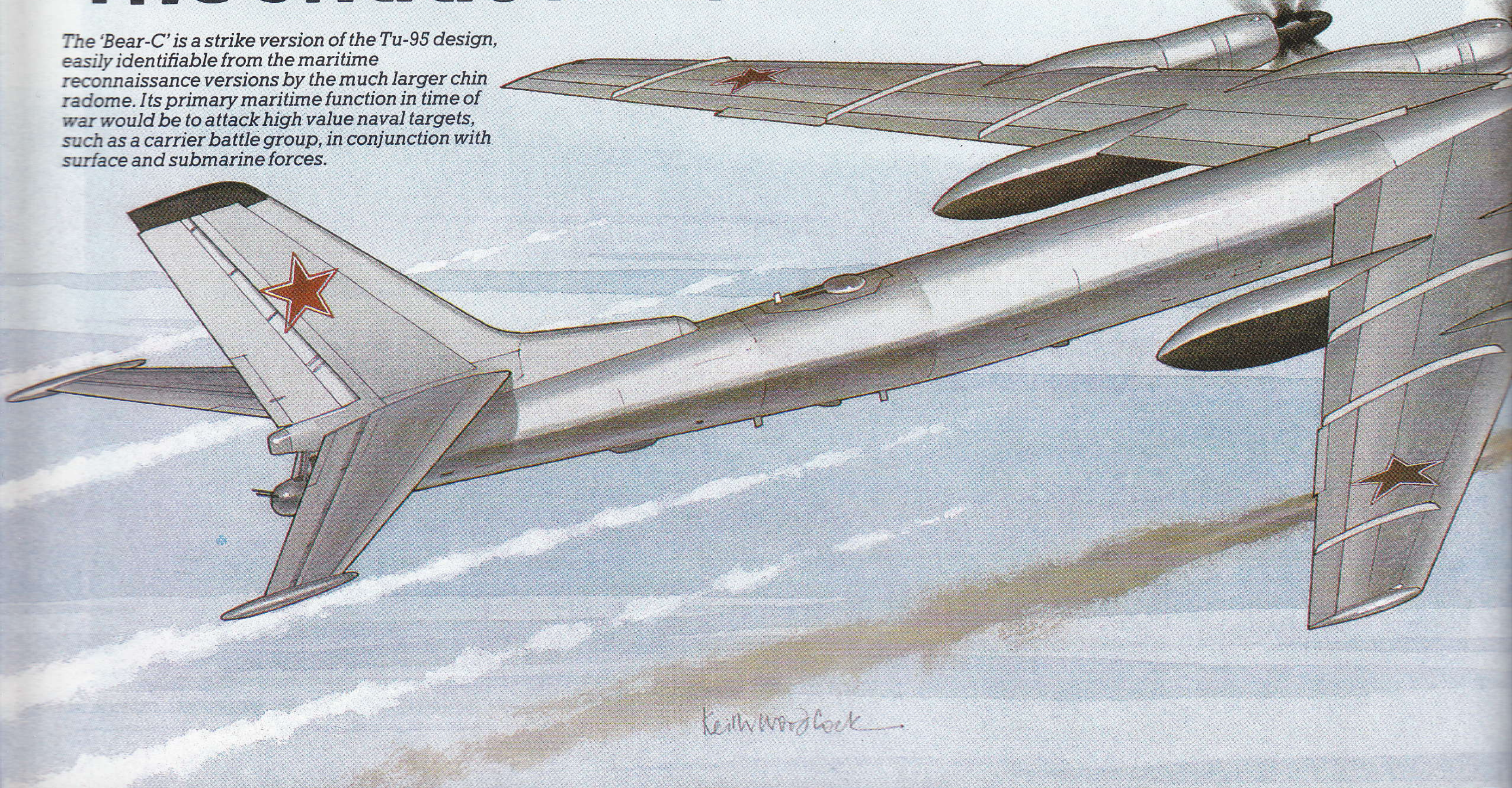
The Castro regime in Cuba has provided the USSR with an ideal location from which to observe the eastern seaboard of the United States and to support Marxist movements in Central America. On average, six 'Bears' are based at San Antonio, south of Havana, from where they can co-operate with Soviet ships regularly deployed in the Gulf of Mexico. 'Bear-Ds' arrived in November 1981, being joined by the ASW 'Bear-Fs' from early-1983 onwards. The latter are deployed to the area apparently to track US nuclear-armed submarines leaving eastern ports. These aircraft form half the South Atlantic surveillance force, the balance coming from the African mainland at Luanda in Angola. Together, the two 'Bear' units can watch the ocean from the Mediterranean approaches to the US coast and down as far as the Cape of Good Hope. Luanda-based 'Bears' conducted limited monitoring of the British task force and its reinforcements during the Falklands war of 1982.

Soviet ships have increased their activities in the Indian Ocean where, inevitably, the 'Bear' is expected to appear in due course, augmenting shorter-range 'Mays' flown from Ethiopia and South Yemen. If 'Bear-Ds' were deployed at Aden in South Yemen, they could reconnoitre the waters as far as the American rapid deployment base at Diego Garcia. Perhaps more galling to the USA is the fact the 'Bears' are now flying from its former base at Cam Ranh, Vietnam, in support of the 25 or so Soviet ships operating in the South China Sea. First arrivals in this region, at Da Nang in April 1979, were two 'Bear-Ds' for surveillance, followed in January of the next year by two ASW 'Bear-Fs', these four aircraft moving to Cam Ranh in June 1980. This was the first occasion on which the two complementary 'Bear' models were seen operating together outside the USSR, although the pattern was soon to be repeated in Cuba.

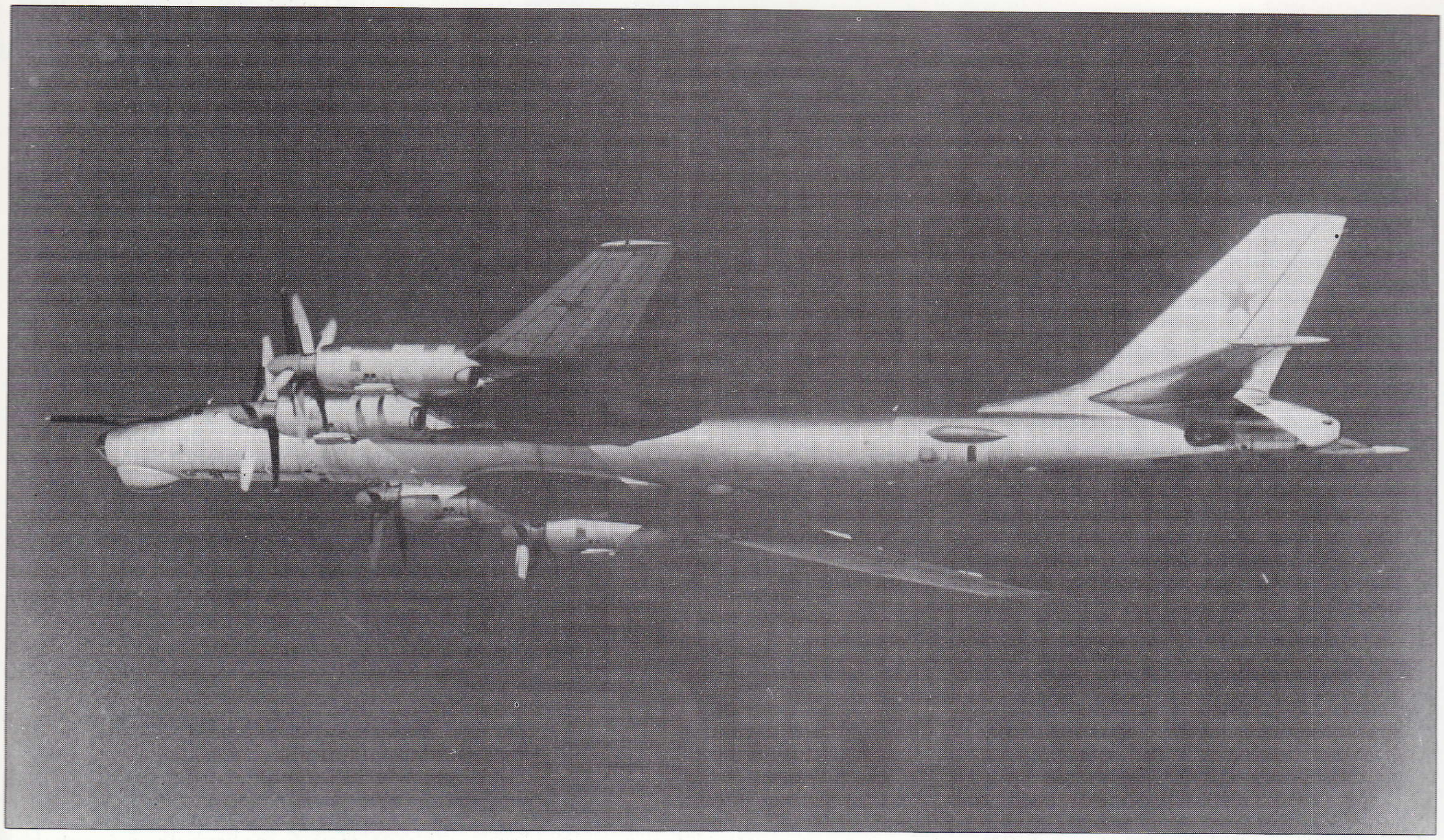
The importance of the 'Bear' deployment was stressed in November 1983 when 10 Tupolev Tu-16 'Badger' jet bombers arrived at Cam Ranh. Tasked with anti-shipping strike, the 'Badgers' would rely on their compatriots for target location, and there has been speculation that a regiment of 25 'Badgers' will eventually be based in Vietnam. Reinforcement or replacement of these aircraft caused a diplomatic incident late in November 1984, when numbers of both types passed through Japanese airspace during their ferry flights.

Few areas of naval importance are now outside the reach of 'Bears' flying from home terri-

The Shadow Strikes

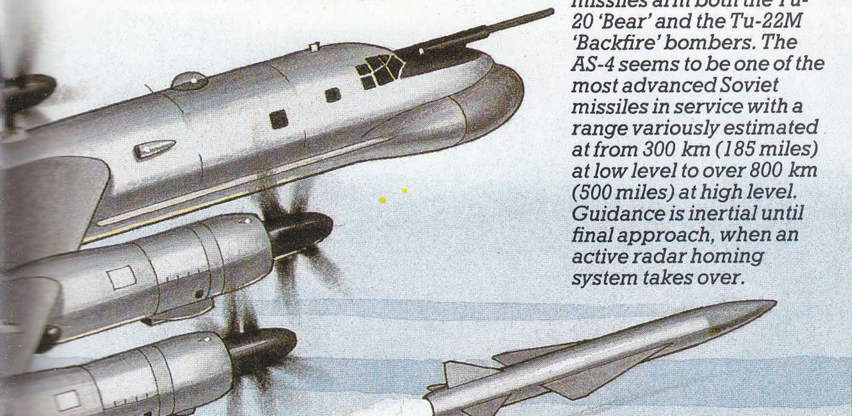


The 'Bear-C' is a strike version of the Tu-95 design, easily identifiable from the maritime reconnaissance versions by the much larger chin radome. Its primary maritime function in time of war would be to attack high value naval targets, such as a carrier battle group, in conjunction with surface and submarine forces.

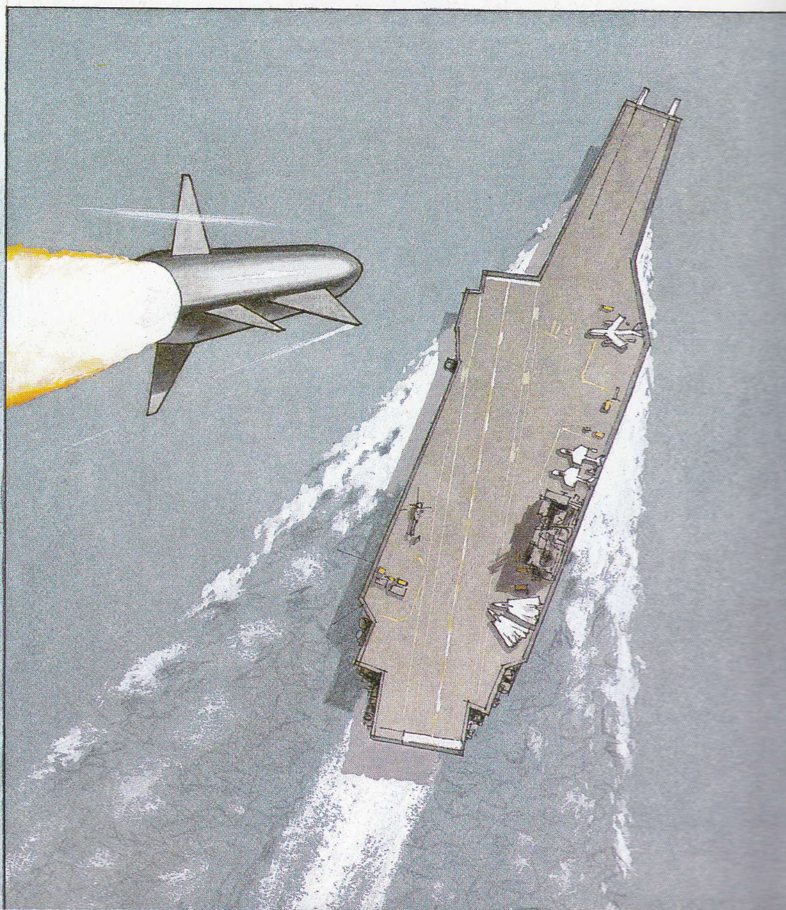


tory or from the airfields of countries friendly to Moscow. In the absence of aircraft operating from large carriers, 'Bears' have provided the USSR with the means to observe the world's shipping lanes and its military traffic, providing vital intelligence to augment that gathered from satellites, ships and submarines. Aerial surveillance is essential for the protection and effective operations of a modern naval force, and in that sense the 'Bear' may be said to have led the Soviet navy out into the oceans of the world.

Above: Intercepted in 1978, this 'Bear-D' has a faired-in tailcone in place of the rear gun turret. This fairing is thought to house yet more electronic sensors for its role of maritime surveillance and over-the-horizon missile targeting.



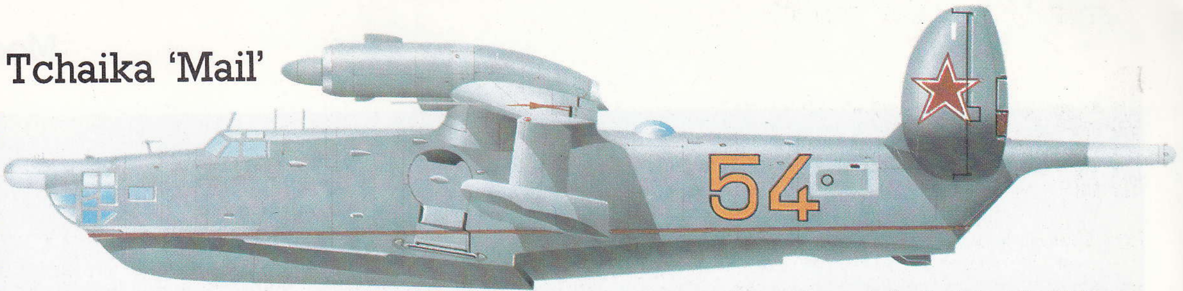
Left: AS-4 'Kitchen' missiles arm both the Tu-20 'Bear' and the Tu-22M 'Backfire' bombers. The AS-4 seems to be one of the most advanced Soviet missiles in service with a range variously estimated at from 300 km (185 miles) at low level to over 800 km (500 miles) at high level. Guidance is inertial until final approach, when an active radar homing system takes over.



Right: Soviet missiles have a range of options when approaching a target. Some may be programmed to attack at low level, although few have genuine sea-skimming ability. A favourite tactic, however, is a high-speed high-level run diving vertically down on the target. For a high-value target such as an aircraft carrier it is probable that a low-yield nuclear warhead would be used.

USSR

Beriev Be-12 Tchaika 'Mail'



Known to the Soviets as the M-12, the Beriev Tchaika (Seagull) is one of the last amphibians to see large-scale military use, for purposes from ASW to electronic intelligence.

One of the world's few remaining amphibious aircraft, the **Beriev Be-12** medium-range patroller is a record-holder par excellence, having swept the board of all 22 distinctions in FAI Class C2 (turboprop flying-boats) and another 22 in Class C3 (turboprop amphibians). Despite these achievements, the aircraft is not a special trials model, but in regular service with the Soviet Northern and Black Sea Fleets, being responsible for anti-submarine and surveillance duties out to some 370 km (230 miles) from shore. An ungainly aircraft, the Be-12 was appropriately named **Tchaika** (seagull) by reason of its gull wing, mounting the engines at the highest point to keep the propellers clear of spray at take-off and landing.

Developments took place during the late 1950s with the intention of replacing the Be-6, and the NATO name **'Mail'** was bestowed following the type's debut at the 1961 Aviation Day display at Tushino, Moscow. Service entry took place around 1965, and at least 100 were delivered before production ended in the early 1970s, about 80 of them continuing to provide naval aviation with a valuable asset. Prominent equipment for the main anti-submarine role are the 'Short Horn' J-band radar in the nose for long-range search and bombing, and a tail-mounted MAD boom. Depth charges and other stores can be released through a hatch in the lower hull, behind the step. Other equipment, such as torpedoes, may be attached externally on two pylons outboard of each engine. At least five crew members are carried, comprising a pilot, co-pilot, engineer, radar/ESM operator and ASW operator (and up to nine when a visual search is to be undertaken). The aircraft also appears to be used for electronic intelligence missions, particularly over the Baltic. Operating from coastal bases, the Be-12 uses a tailwheel landing gear, the main units of which fold upwards into the hull, although the tips of the wheels remain visible. Stabilizing floats mounted close to the wing tips are fixed. Be-12s ceased operation from Egypt in EAF insignia when that country distanced itself from the USSR, but since 1981 up to a dozen have been delivered to Vietnam (apparently still Soviet-crewed) for missions over the South China Sea. The type is also known as the **M-12**.

Specification

Be-12 'Mail'

Type: amphibious maritime patrol aircraft

Powerplant: two 3124.8-ekW (4,190-ehp) Ivchenko AI-20D turboprops

Performance: maximum speed 608 km/h (378 mph); initial climb rate 910 m (2,986 ft) per minute; service ceiling 11280 m (37,008 ft); maximum range 4000 km (2,485 miles)

Weights: empty about 20000 kg (44,092 lb); maximum take-off about 29450 kg (64,926 lb)

Dimensions: span 29.71 m (97 ft 5.7 in); length 30.17 m (98 ft 11.8 in); height 7.00 m (22 ft 11.6 in); wing area 105.0 m^2 (1,130.2 sq ft)

Armament depth charges, torpedoes and bombs carried internally or on four wing pylons.

USSR

Ilyushin Il-38 'May'

Ilyushin's Il-18 turboprop was one of the most successful Soviet passenger liners, with enormous production and exports, including many used by air forces. In about 1967 his design bureau flew the first **Il-38** ASW conversion, very similar to that effected by Lockheed to produce the P-3 Orion, though in Ilyushin's case the internal equipment resulted in a remarkable forward shift of the wing. The original circular-section pressurized fuselage is slightly lengthened and the windows replaced by a few small ports, and shallow weapon bays are added ahead of and behind the low-mounted wing. The forward shift of the wing may have been in order to leave the long rear fuselage devoid of metal to improve performance of the MAD stinger in the extended tailcone. It cannot be accounted for merely by the weight, under the forward fuselage, of the surveillance radar, which resembles that of some Ka-25 helicopters. The absence of wing pylons is noteworthy. Crew is reported to number 12, eight being mission operators in the main tactical compartment. Production was probably about 100, completed in the early 1970s. In 1972 several operated from Egypt, and in 1979 Il-38s (called **'May'** by NATO) operated from the Yemen. India bought three ex-AV-MF (Soviet navy) aircraft, which fly from Goa with No. 315 Sqn.

Specification

Il-38 'May'

Type: maritime patrol and ASW aircraft

Powerplant: four 3169.2-ekW (4,250-ehp) Ivchenko AI-20M turboprops

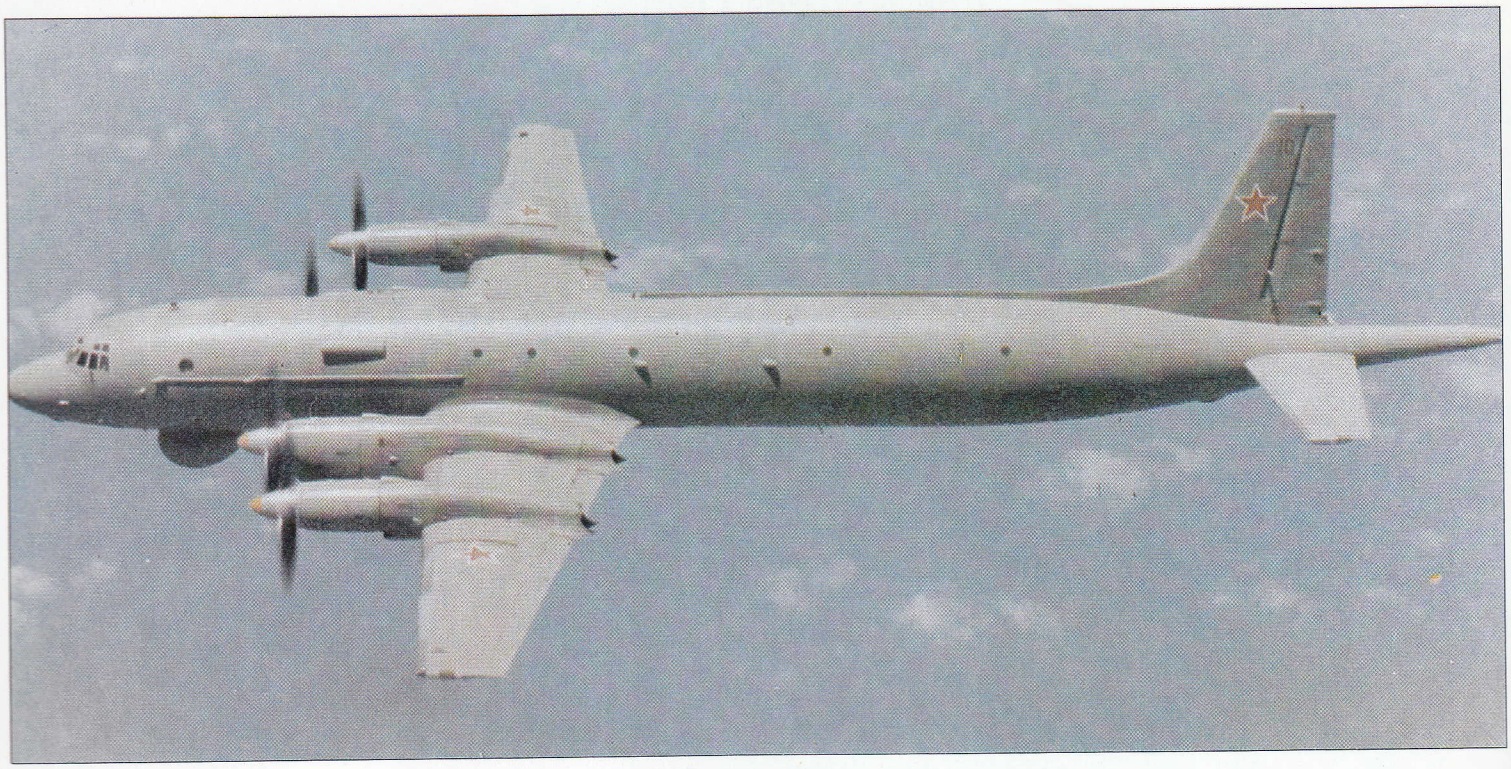
Performance: (estimated) cruising speed 645 km/h (401 mph); range 7250 km (4,505 miles)

Weights: (estimated) empty 36300 kg (80,028 lb); maximum take-off 64000 kg (141,096 lb)

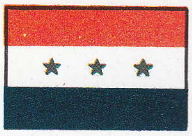
Dimensions: 37.40 m (122 ft 8.4 in); length 39.60 m (129 ft 11.1 in); height 10.17 m (33 ft 4.4 in); wing area 140.0 m^2 (1,507.0 sq ft)

Armament: not known, but certainly includes numerous sonobuoys and AS torpedoes housed internally; wing hardpoints have been reported but remain unconfirmed

Like its slightly earlier contemporary, the Orion, the Il-38 was evolved from a civilian airliner. Some 60 are believed to be operational with the Soviet navy and can be found over the Atlantic, Mediterranean and, increasingly, over the Indian Ocean. Three ex-Soviet models are in Indian service.



Iraq



For centuries Iraq has been one of the most turbulent of all the nations in the Middle East, and has been beset by a tradition of internal unrest and an aggressive foreign policy. Historically, military action has followed a cycle of victory and then defeat leading to expansion followed by occupation, and the nature of the population is such that it has a reputation for ungovernability. In recent years this latter problem has been partially corrected by the imposition of a rigid military autocracy leading to a period of relative stability, but for the armed forces this period has been marked by a constant war against the Kurds, a warlike minority seeking autonomy. This Kurdish war has now been going on for over 15 years but in recent times has been overshadowed by the now stalemated Iran-Iraq conflict.

Although this war has now settled down into a state of virtual immobility, it still occupies most of the Iraqi armed forces' resources and manpower. Unlike their opponents, the Iraqis do at least have the advantage that their armed forces are still in a cohesive state and new weapons and supplies are obtainable. The air force is still active and the small navy is still operating. However the Iraqis simply lack the strength to overcome their opponents who are still numerically superior, in men if not in matériel. When Iraq invaded Iran back in September 1980 all went well, though only at first. The subsequent Iranian counteroffensives pushed the Iraqis back into Iraqi territory, but the two sides are now unable to make any marked impact upon each other. Iran has already resorted to chemical warfare in an attempt to make a breakthrough and the Iraqis are currently using their air force to attack the oil tankers and oil installations that shore up Iran's shaky economy. Throughout this war, as in the Kurdish war, it is the Iraqi army that is bearing the brunt of the fighting, and to date casualties have been heavy (but virtually impossible to quantify). But the army, like the air force and navy, remains a cohesive body.

The Iraqi Army

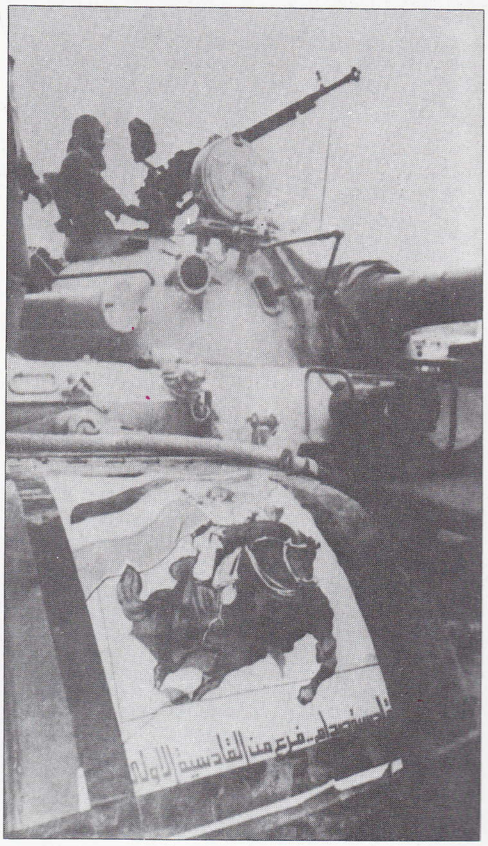
At any one time the Iraqi army is some 475,000 strong, the very great majority of these men being conscripts. Conscripts normally serve a two-year term, but the war has meant that many have to remain in uniform much longer. Many of the army's reserves of 100,000 men have also been recalled for service. The army is organized into a number of corps, four in all, made up from six armoured divisions, four mechanized infantry divisions and six infantry and mountain divisions. There are also two Republican Guard armoured brigades, mainly retained for the personal use of the president, and three special-forces brigades which, as their name implies, are used for purposes such as behind-the-line operations or airborne missions. There are nine reserve brigades, and to these can be added 15 People's Army and other volunteer infantry brigades, not all of which are for front-line use.

In recent years Iraq has deliberately tried to get away from a reliance on the Soviet Union for all arms supplies, but the army is still largely equipped with Soviet weapons. There are over 2,100 tanks in service including T-54, T-55, T-62 and T-72 main battle tanks (MBTs). To these can be added about 100 PT-76 amphibious tanks and an undefined number of ex-Chinese T-69 tanks. Captured equipment has also been impressed for use (including numbers of Chieftain MBTs), and other equipment has been passed to Iraq by supportive Arab nations such as Kuwait. Other armour includes virtually the entire range of Soviet armoured personnel carriers and light armoured vehicles, but in recent years more have arrived from Brazil. Brazil is now one of Iraq's major weapon suppliers and in Iraqi service are EE-3 armoured cars, EE-9 Cascavel light armoured vehicles and EE-11 Urutu armoured personnel carriers. Other equipment has come from France (Panhard M-3 armoured cars) and Switzerland (MOWAG wheeled armoured vehicles). Czechoslovakia has been another weapons supplier.

The Iraqi artillery is a powerful arm with well over 3,500 pieces of towed and self-propelled ordnance. Most of the weapons are of Soviet origin and include large numbers of FROG rockets and even heavy mortars. Anti-tank weapons include Soviet guns, Austrian tank destroyers and missiles including the Soviet 'Sagger', French SS.11, HOT and Milan, and British Swingfire weapons. Air defence weapons include all the usual Soviet missiles, large and small, along with numbers of Soviet anti-aircraft guns. As with the armour, many ex-Iranian weapons are in service.

The main point to bear in mind at the moment is that Iraq is still obtaining supplies of weapons from a number of sources while Iran is not. Weapons continue to be sent to Iraq from Brazil, France and many other nations; for example, a new weapon recently delivered by France has been the 155-mm (6.1-in) GCT self-propelled gun. Many Arab nations support Iraq in the conflict with Iran, and even if they do not provide weapons they donate funds for arms purchases.

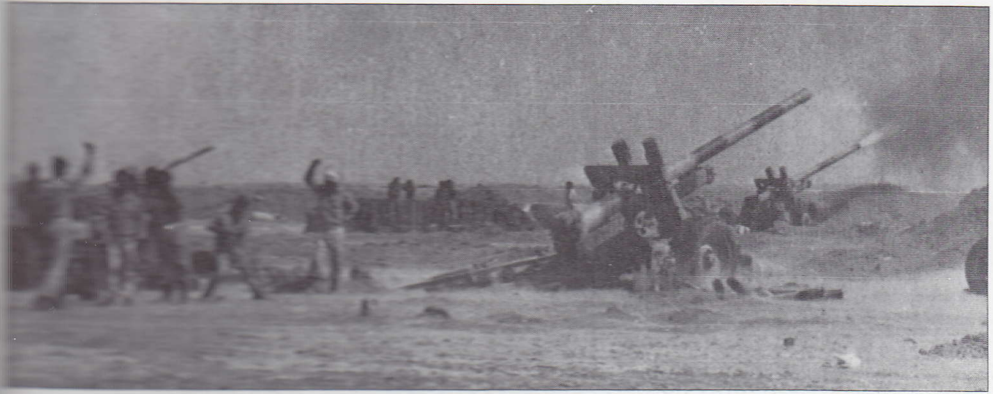
Another point to bear in mind with the Iraqi army is that it remains an organized fighting force, even after four years and more of constant war, to say nothing of the war against the Kurds that still splutters away in the mountains to the north. But set against this is the fact that the Iraqi regime is a military dictatorship that retains its hold on power to great extent by the imposition of military force. During the early days of the war with Iran many political differences were set aside and for a period even the Kurds ceased their small war, but as the war continues and no results are to be seen, the army is being used increasingly to maintain internal stability, and at times combat units have had to be withdrawn from the front for internal security duties. In theory the People's Army is used for this purpose, but the fact that it is found necessary to employ combat units for the task speaks volumes in itself.



The poster on this T-55 commemorates the great Arab victory over the Persians in 637 at Qadisiya. President Hussein gambled he could win another, but his attack stalled, embroiling Iraq in a war of attrition against a country with three times its population ruled by uncompromising fanatics.

The Iraqi Navy

The Iraqi navy is an integral part of the army, and numbers only about 4,000 men. The main naval bases are at Umm Qasr and Basra. The largest Iraqi ship is a single training frigate, the main combat strength being formed by a number of small attack craft or coastal vessels. During the war with Iran the Iraqi navy has been engaged in some spirited scraps with the Iranian navy, and has suffered accordingly in men and vessels. In time, however, these losses



Iraqi gunners pound the Iranian oil city of Khoramshahr with Russian M1931/37 (A-19) 122-mm guns. Iraq has about 3,500 guns, mostly of Soviet origin, varying from these World War II models to the latest Soviet equipment. Holding positions against Iranian human wave attacks, the Iraqi forces rely heavily on such long-range firepower.

Iraqi infantry use a bewildering variety of Soviet, French, Brazilian and, in this case, Czech APCs; these are OT-64Cs, capable of carrying up to 15 men in addition to their two-man crew. The turret mounts a 14.5-mm KPVT machine-gun with a co-axial 7.62-mm MG.

A T-62 crosses the Karoun river in October 1980, as the advance into Iran continues. Until the invasion of Iran, Iraqi tanks were more usually seen on the streets of Baghdad or surrounding the Presidential palace during the frequent coups d'état.

will be more than compensated by the arrival of four frigates and six corvettes currently on order from Italy. These will have logistical backing from a new support ship. In the meantime the main striking force of the navy is invested in about six or seven ex-Soviet 'Osa' class missile-armed fast attack craft.

The Iraqi Air Force

The Iraqi air force is a separate arm from the army, and has a numerical strength of 38,000 men, including air-defence personnel. It is still organized very much along Royal Air Force lines, a legacy of the period when the UK occupied Iraq, but much of the equipment is Soviet in origin. However, determined efforts have been made to diversify supply sources and thus some French aircraft are used along with the remaining few Hawker Hunters (and Westland Wessex helicopters) from many years back.

The Iraqi air force is one of the most powerful in the Middle East, and despite combat losses it remains an effective operational force still. It includes among its aircraft some of the most sophisticated Soviet warplanes available, and it still manages to obtain the latest types from the Soviet Union, although aircraft from France have been among the most recent aircraft arrivals; these include Dassault-Breguet Mirage F.1 fighters and the well-known combination of Dassault-Breguet Super Etendards and Exocet missiles.

The main striking force of the air force is its two bomber squadrons, one with the Tupolev Tu-22 'Blinder' and the other with venerable Ilyushin Il-28 'Beagle' bombers. Combat has cut down the numbers of these to perhaps seven and five respectively, but these two squadrons are still able to provide a powerful raiding potential. There are no fewer than 11 fighter/ground attack squadrons with a mix of Mikoyan-Gurevich MiG-23BM 'Flogger', Sukhoi Su-7 'Fitter' and Sukhoi Su-20 'Fitter' aircraft along with the few remaining Hunters. The five interceptor squadrons have an even more varied mix of MiG-19 'Farmer', MiG-21 'Fishbed' and MiG-25 'Foxbat' aircraft along with the first of the Mirage F.1s to arrive. The MiG-19s and MiG-21s come from both Soviet and Chinese sources.

The advanced MiG-25 'Foxbat' also equips a single reconnaissance squadron, and there are two transport squadrons, again with a varied mix of Antonov transports, Ilyushin Il-76 'Candid' heavy transports (including some impressed civilian examples), Ilyushin Il-14 'Crate' light transports and two Tupolev Tu-124s. More transport capability is supplied by 11 helicopter squadrons. The range of equipment used by these squadrons is wide, and covers all the usual Soviet Mil designs, French Aérospatiale Super Frelons and Gazelles, West German MBB BO105s, and the last of the ex-British Wessex helicopters.

A great deal of equipment is on order for the air force, some of it combat replacements, but much of it new. A portion of this new equipment, including missiles, is already to hand and has been used in action against the Iranian oil installations and tankers in the Persian Gulf. The Iraqi air force at present has air superiority over the remains of the Iranian air force, and as supplies of new matériel continue to arrive it seems set to retain this superiority for some time to come. It has certainly been one of the major reasons why the Iranian army is unable to use its manpower to 'steamroller' through the Iraqi army lines.

Order of battle
Iraqi Army

6 armoured divisions (T-54, T-55, T-62, T-72 and Chieftain MBTs, PT-76 light tanks, and numerous armoured car types)
4 mechanized infantry divisions (BRDM, FUG-70, ERC-90, MOWAG, EE-9 and EE-3 armoured cars, and BMP, BTR-50, BTR-60, BTR-70, OT-62, OT-64, Panhard and EE-11 APCs)
6 infantry and mountain divisions
2 Republican Guard armoured brigades
3 special forces brigades
9 reserve brigades (mostly infantry)
15 People's Army and volunteer brigades
various security troops
some 10,000 volunteers from other Arab countries

Iraqi Navy

1 training frigate
8 'Osa' missile attack craft
3 'SO-1' large patrol craft
6 'P-6' torpedo attack craft
6 coastal patrol craft
5 'T-43' minesweepers
3 tank landing craft

Iraqi Air Force

2 bomber squadrons (Tu-22 'Blinder' and Il-28 'Beagle')
11 fighter/ground attack squadrons (MiG-23BM 'Flogger', Su-7 and Su-20 'Fitter', and Hunter)
5 interceptor squadrons (MiG-25 'Foxbat', MiG-19 'Farmer', MiG-21 'Fishbed' and Mirage F.1)
1 reconnaissance squadron (MiG-25 'Foxbat')
2 transport squadrons (An-2 'Colt', An-12 'Cub', An-24 'Coke', An-26 'Curl', Il-76 'Candid', Il-14 'Crate' and Tu-124 'Cookpot')
11 helicopter squadrons (Mi-4 'Hound', Mi-6 'Hook', Mi-8 'Hip', Mi-24 'Hind', Alouette III Super Frelon, Gazelle, Puma, BO105 and Wessex)

A Hawker Hunter FGA.Mk 59 of the Iraqi air force is seen at Dunsfold before delivery. Iraq received its first Hunters in 1957, and large numbers of refurbished aircraft, like this ex-Belgian example, have been procured subsequently. Thanks to the British occupation of Iraq, the modern Iraqi air force owes much of its organization and doctrine to RAF practice.